

Association of Schools of Construction of Southern Africa



PROCEEDINGS

**The Fourth Built
Environment Conference**

**17 - 19 May 2009
Livingstone - Zambia**



PREFACE

The Fourth Built Environment conference provides an international forum for researchers and practitioners from developed, developing and underdeveloped nations to address fundamental problems and constraints that affect the Built Environment. The broad objectives of the conference are:

- To provide a forum for multi-disciplinary interaction between academics and practitioners;
- To provide an internationally recognized, accredited conference for the built environment;
- To disseminate innovative and cutting edge practices, and
- To contribute to the built environment body of knowledge (BEBOK).

The organizers aim to bring together in a single forum researchers, academics, administrators and practitioners representing educational institutions, government agencies, contracting organizations, consulting enterprises, financial institutions, and other construction related organizations. The conference has a broad scope and topics are organized around the conference theme of The Built Environment.

In particular, the conference will seek responses to the following critical questions:

- What changes would lead to improvements?
- How can informal technology contribute to improvement?
- What are the barriers to change?
- What economic levers can be used?
- How can informal construction sector and SMME problems be addressed?
- How can education, training, and professional development be improved?
- How can all industry participants be integrated?
- How can communication and management difficulties be addressed?
- How can safety, health, and environment risks be better recognized, understood and avoided?
- How can diversity and exclusivity be promoted?
- How can the regulatory environment be more effective?

These internationally peer reviewed and edited proceedings are aimed at contributing significantly to the body of knowledge relative to the science and practice of construction and the improvement of construction health and safety on sites not only in South Africa but everywhere that construction is being done.

Theo C Haupt
Livingstone, Zambia
May 17, 2009



ACKNOWLEDGEMENTS

The organizing committee of The Fourth Built Environment conference, held in Livingstone, Zambia, wish to thank the Copperbelt University in Zambia, the Southern African Built Environment Research Center (SABERC) at the Cape Peninsula University of Technology in South Africa, the Council of the Association of Schools of Construction of Southern Africa and membership universities and individuals for supporting this conference through their valued contributions.

Without the substantial financial support of the major conference sponsor, the Council for the Built Environment (CBE), the sponsor of the welcome function and lunches, the Construction Industry Development Board (CIDB), sponsor of the closing function and conference pen, Wiehahn, this conference and the further development and growth of the Association of Schools of Construction of Southern Africa (ASOCSA) with respect to its mission in the region would not have been possible. Further, this support demonstrates the commitment of the sponsors to the further development of the body of knowledge relative to the science and practice of construction. This commitment is deeply valued and acknowledged.

Our thanks are extended to Professor Theo Haupt (SABERC) and the Council of ASOCSA who worked unstintingly on every aspect of the conference. Together with the Scientific and Technical Committee and additional reviewers to whom special thanks are extended they worked hard and long to prepare refereed and edited papers and published proceedings of the highest standard that satisfy the criteria for subsidy by the South African Department of Education.

Special mention is necessary of Ms. Charlene May and Mr. Ruben Ndiokubwayo for their efforts relative to this conference - often under extremely difficult and trying circumstances.

The contribution and excellent support of our webmasters, Wendal Koopman and Shihaam Geyer, in setting up and supporting our conference website is appreciated.

Finally, the sterling contribution and efforts of Ferial Michaels and her staff at RFM Design to the success of this conference is acknowledged in their capacity as conference organizers working with the conference committee and evident in the superlative logistic coordination and attention to detail in every aspect of the conference organization.



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- Relevance to conference theme and objectives;
- Originality of material;
- Academic rigour;
- Contribution to knowledge;
- Research methodology and robustness of analysis of findings;
- Empirical research findings; and
- Critical current literature review.

Authors whose papers were accepted after this second review were provided with additional anonymous reviewers' comments and requested to submit their revised full papers. These final papers were included into both the conference presentation schedule and the conference proceedings, having been multiple peer-reviewed for publication. At no stage was any member of the Scientific and Technical Committee or the editor of the proceedings involved in the review process relative to their own authored or co-authored papers. The role of the editor was to ensure that the final papers incorporated the reviewers' comments and arrange the papers into the final sequence based on the conference presentation schedule as captured on the CD-ROM and Table of Contents. Of the 63 abstracts originally received, only 36 papers were finally accepted for presentation at the conference and inclusion in these proceedings, representing a rejection rate of 43,9%. To be eligible for inclusion these papers were required to receive a minimum score of 3 out of 5 allocated by the peer reviewers during the final review process.



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Association of Schools of Construction of Southern Africa

History

ASOCSA is not the first attempt to form a body that addresses, inter alia, matters of construction education and training. In the days of the Building Industries Federation South Africa and the National Development Fund there were regular annual meetings of the Heads of Departments that offered construction-related programs. Recognizing the two-tiered higher education sector in South Africa, there were separate meetings for universities and the former technikons. In the more recent past, the Chartered Institute of Building - Africa initially convened annual educators' forums that did not quite fulfill the same function as the previous forums. However, during 2005 the very first meeting of University Heads of Departments drawn from all higher education institutions in South Africa met for the very first time since the re-landscaping of the sector in the same venue to discuss matters affecting construction, and particularly construction education in the country. This meeting was repeated in 2006 where the need was expressed for the establishment of a formal forum / association of universities to engage in discussion / debate / collaboration / promotion of matters of mutual interest.

Broad Aims

ASOCSA aims to be the professional association for the development and advancement of construction education in Southern Africa, where the sharing of ideas and knowledge inspires, guides and promotes excellence in curriculums, teaching, research and service. To achieve this aim ASOCSA is partnering with the construction industry to find ways to effectively represent the interests of both construction academic and industry practitioners. ASOCSA will offer a variety of programs and services designed to help its members serve their customers more effectively and succeed in an increasingly challenging environment of construction information management and technology. To this end ASOCSA provides a forum for the debate and discussion of issues of mutual interest to all industry stakeholders. For example, one of the tasks of ASOCSA will be supporting the development of curriculums that address the needs of the construction sector in the Southern African region. ASOCSA convenes an annual conference where construction academics and practitioners can interact relative to practical experience and the findings of relevant research.

The Journal of Construction presently published twice per year is the official journal of ASOCSA and more than 5,000 complimentary copies



are distributed to all industry stakeholders in the Southern African region. The production and distribution of practice notes and technical papers is a further endeavor to grow the partnership between academia and industry.

With respect to the Southern African region, ASOCSA is committed to the following:

Vision

To be the custodian of construction related higher education

Mission Statement

To promote, facilitate, develop and monitor the relevance and quality of construction related curricula, research and graduates in conjunction with higher education institutions, industry and government.

Strategic objectives

The objectives of the Association are:

- to promote and facilitate the development of curricula for construction related programmes
- to facilitate accreditation of construction related programmes
- to hold an annual conference that acts as a forum for multi-disciplinary interaction between academics and practitioners
- to publish an accredited research-based journal and contribute to the built environment body of knowledge (BEBOK)
- to disseminate information dealing with construction education and related matters
- to develop and maintain closer links with industry and government
- to represent the collective views of its members
- to liaise with other organisations and persons to promote the interests of its members
- to promote and support relevant postgraduate research
- to provide bursaries to postgraduate students in accordance with set criteria

ASOCSA continues to seek opportunities to promote both academic and industry employment opportunities. Finally, ASOCSA intends to play a significant role in the accreditation of construction-related academic programs.



Meeting of Heads of Schools and Departments of Construction

ASOCSA believes that meetings of Heads of School and Departments of Construction is a vital component of its functions and holds Heads meetings at the end of each conferences in addition to bi-annual Heads meetings.

International Affiliation

ASOCSA has commenced discussions about closer collaboration with similar institutions such as the Associated Schools of Construction (ASC) in the United States and the Royal Institute of Chartered Surveyors (RICS).

In summary, benefits of membership of ASOCSA which are self-evident include participation in meetings of Heads of construction programs throughout the region, access to the Journal of Construction, reduced rates at all ASOCSA events, involvement at regional level with industry-academia forums, interaction and networking opportunities relative to, for example, collaborative research, curriculum development, external moderation of courses, and external examination

ASSOCIATION OF SCHOOLS OF CONSTRUCTION OF SOUTHERN AFRICA

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For more information on ASOCSA and its activities visit www.asocsa.org



TAX BENEFIT

ASOCSA is a registered Public Benefit Organization as defined in Section 30 of the Income Tax Act and a registered Section 21 Company as defined in the Companies Act. Therefore all donations made to ASOCSA will be fully deductible for income tax purposes and a section 18A certificate, for proof of deductibility will be issued to the donor upon receipt of the donation. The deductible donation is limited to 10% of the donors' taxable income before providing for Section 18A and Section 18 deductions.



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COUNCIL FOR THE BUILT ENVIRONMENT (CBE)

Vision

To provide sustainable built environment professions, serving public and national interest.

Mission

To facilitate integrated development, whilst promoting efficiency and effectiveness through leadership of the built environment professions.

Core Values

Integrity

We will carry out our responsibility in a manner that will preserve and enhance the integrity of the organisation.

Transparency

We recognise that the CBE is a public entity and are committed to providing accurate and reliable information to all our stakeholders.

Excellence

We will endeavor to achieve the best possible standards in all we do.

Innovation

We will seek out and employ superior, more affordable solutions to meet the needs of our clients, stakeholders and end-users.

The Council for the Built Environment (CBE) was established in terms of the Council for the Built Environment Act, 2000 (Act No. 43 of 2000). The Council was tasked with addressing the shortcomings in the built environment, in order to create a climate that would enable ongoing transformation and development of professions in the built environment. Currently, the following built environment councils are statutorily governed by CBE, namely

Engineering Council of South Africa
South African Council for the Architectural Profession
South African Council for the Quantity Surveying Profession
South African Council for the Property Valuers Profession
South African Council for the Landscape Architectural Profession



South African Council for the Project and Construction Management Professions

The CBE is the most significant however, being the authoritative, all encompassing structure incorporating all these councils. It provides leadership to the professions, ensuring good governance, and serves as a two-way channel between councils and the government, thus guaranteeing coordinated input into a restructuring and development process that is in the public interest.

The CBE, *inter alia*,

Champions sound governance of the professions, appropriate standards of health, safety and environmental protection, standards of training as well as ongoing human resource development. The underlying aim is to protect the interests of the public and to maintain a sustainable environment – both built and natural.

- Serves as a forum where the built environment professions, through their respective councils, can interact and address matters of mutual interest, to the benefit of the built environment.
- Serves as a facilitator, encouraging the professions to integrate their development within the context of government's national goals.
- Acts as a sentinel, put into place to ensure the application of norms and guidelines.

CBE works closely with government in terms of policy implementation. It also advises on policy changes, to ensure the growth of healthy professions that conform to best practice standards and quality built environments. It seeks to create public consciousness of issues within in the built environment.

The CBE fosters alignment between the individual Councils while serving as the nexus, providing strategic leadership from within the built environment professions.





THE CONSTRUCTION INDUSTRY DEVELOPMENT BOARD (CIDB)

The Construction Industry Development Board (cidb) of South Africa continues to show commitment towards the construction-related fields by sponsoring the 4th Built Environment Conference which convenes in Zambia between the 17th and 19th May 2009.

The Conference will bring together researchers, academics and business to discuss built environment: construction-related research, development and education from different parts of the world.

The 4th Built Environment Conference will discuss critical topics such as sustainable construction, education and professional development, service delivery, customer service, information technology, health and safety, and construction industry development amongst other important topics.

Support and commitment by cidb South Africa to the conference and the development of the industry at large is not only expressed through sponsorship but also through the keynote address to be delivered at the Conference by cidb's CEO Mr Ronnie Khoza and through a presentation of two papers titled "Changing the Tide in Infrastructure Delivery in Developing Countries" and "The State of Contractor Development".

The first paper focuses on Service Delivery / Customer Service by presenting an alternative delivery model of "supply chain" which aims to deliver infrastructure as well as other deliverables relating to poverty relief, enterprise development and training.

The second paper titled "The State of Contractor Development in South Africa", reports on qualitative and quantitative overview of the state of contractor development in the General Building and Civil Engineering sectors in South Africa –both papers give recommendations to the findings. "Our support to the international 4th Built Environment Conference is part of our effort and is in keeping with our motto-'development through partnership' to collaborate with various stakeholders and colleagues, locally and internationally towards contractor development.

In presenting the two papers we are encouraging industry role players to participate in writing and presenting good quality papers, thus developing and improving skills and sustainable delivery within the industry. " says Khoza.



The cidb was established in terms of the CIDB Act (Act 38) of 2000 to regulate and develop the construction industry for improved performance in infrastructure delivery and aims to provide leadership to stakeholders and to stimulate sustainable growth, reform and improvement of the construction sector for effective delivery and the industry's enhanced role in South Africa's economy.

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WIEHAHN – SETTING THE PACE IN FORMWORK SOLUTIONS & SERVICES

With the solid foundation provided by more than 40 years of experience in the supply of formwork solutions to the construction industry in South Africa, Wiehahn is fast becoming the industry leader supplying to all of the key construction companies nationally. Wiehahn continues to support ASOCSA and therefore research and development of the formwork industry to ensure expertise in the Built environment.

Founded in 1968 as Wiehahn Equipment, the company today is widely recognised as a premier brand in the building, general construction and civil engineering industries and as a leader in the supply of formwork systems, solutions, design, consulting and related services.

By 1999 the company had achieved high status and wide recognition as an expert in its field and a milestone achievement that year was securing the sole distributorship in Southern Africa for the internationally renowned PERI formwork systems designed and manufactured in Germany. This marked the beginning of a paradigm shift in the South African construction industry as Wiehahn introduced innovative formwork solutions that bordered on the revolutionary and produced outstanding results. Today Wiehahn has an indefinite sole distribution agreement with PERI GmbH.

Having infinitely proved its worth in building, slab and beam formwork solutions Wiehahn is now strongly focused on the civil engineering arena with a dedicated civils division that has great depth in technical expertise to service this specialised market. The company's growth and potential is underlined by the fact that it now supports eleven operations in South Africa, a head office and branch located in Cape Town and branches at Midrand, George, Port Elizabeth, East London, Durban, Bloemfontein, Nelspruit, Polokwane, Richards Bay and Rustenburg.

Over the past decade Wiehahn has distinguished itself as market leader and top performing company, supplying a wide range of formwork that includes both conventional and technologically advanced systems backed by design and technical support that ensures clients benefit from custom-made, fit-for-purpose solutions no matter what type or size of concrete structure is required.

Wiehahn's strengths lie in its well-developed infrastructure, product maturity, large stockholding and sustainable long-term client relationships. Today, more than ever before, the company is perfectly positioned to exceed client expectations in all facets of formwork solutions.



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ASSOCIATION OF SCHOOLS
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Association of Schools of Construction of Southern Africa

Association Incorporated in Terms of Section 21 Registration Number 2007/035311/08

17 May 2009

Dear Author

PEER REVIEW PROCESS: 4TH BUILT ENVIRONMENT CONFERENCE: LIVINGSTONE: 2009

I confirm that the following peer review process was strictly followed relative to this conference.

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- Research methodology and robustness of analysis of findings;
- Empirical research findings; and
- Critical current literature review.

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Regards



Ferial Michaels

Conference Organiser



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PERFORMANCE EVALUATION OF ALTERNATIVE PROCUREMENT METHODS IN TANZANIAN CONSTRUCTION INDUSTRY

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ABSTRACT

Worldwide, the Construction Industry (CI) has been involved in reviewing its performance and formulating plans for improvement. CI's performance is not satisfactory and the continual improvement of the industry was given a high priority by establishing bodies to monitor and evaluate the progress of the industry.

Purposes

This paper aimed at informing the public on the procurement related factors that affect project performance in Tanzania, the reasons for continual use of Traditional Building Procurement Method (TBPM) and the current knowledge level of Professionals and Clients on the applicability and impact of new procurement systems on the project success.

Methodology

Methodologies adopted in obtaining data were questionnaires and interviews, coupled with survey results from the Construction Industry practitioners.

Findings

Findings shows that the knowledge level of professionals in the usage and applicability of Alternative Procurement Methods (APM) in Construction projects is still inadequate, and requires more training to change the outcome. They also prove that Alternative Procurement Methods have a significant contribution to the project success based on project characteristics.

Recommendations

The study outcome simplifies choices of appropriate procurement methods, decision making and prediction of the anticipated project performance for desired results. They triggered the interest of stakeholders on the influence of new procurement methods to the project success.

KEYWORDS: Construction Industry, Traditional Building Procurement Methods, Alternative Procurement Methods, Project Performance/Success.

1. GENERAL

In the past few decades, the recognition of the importance of the Construction Industry (CI) to the economic development of Tanzania and its contribution to the national economy has been scrutinized by different researchers, (Fanirah, 2000).

Thus, CI is important in the overall development of the country's economy as indicated by National Construction Council (NCC). According to (NCC, 2001), the Gross Domestic Product (GDP) at current prices has an upward trend with a sharp rise in 1996 and onwards. The Gross Domestic Product in a real value had a downward trend from 1992 up to 1995 and then started an upward trend in 1996 rising rather marginally up to 2000. This trend continues up to date.

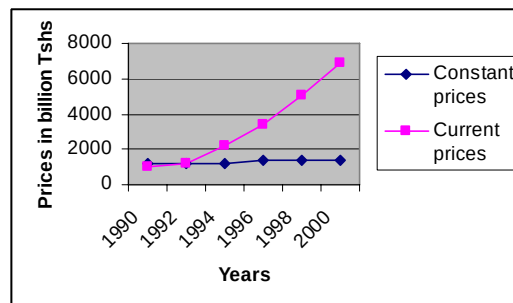


Figure 1.1: Share of Construction Industry to GDP
Source: NCC (2001)

According to NCC, (2001), The Capital Formation (CF) for construction at current prices has been rising steadily by 5 percent in 1993, then 33 percent in 1994, 6 percent in 1995, then rose sharply by 22 percent in 1996. From 1996, CF has been rising steadily up to 1999. The increase in both 1997 and 1998 was 13 percent while the increase in 1999 was 11 percent. On the other hand, CF for the construction sector reveals values at constant prices has been falling over the years from 1992. The drop was 16 percent in 1993 and 19 percent in 1995. However, there was an

increase of 6 percent in 1996, but then declined by 8 percent in 1997, and rose, marginally by 2 percent in 1998 and declined by 1 percent in 1999.

2. PERFORMANCE CHARACTERISTICS OF A CONSTRUCTION PROJECT

The main aim of undertaking a construction project is the provision of goods and services to the satisfaction of the Client; However, Client satisfaction is a subjective concept. It is basically this concept that the project Management team, seeks to satisfy for the project to be regarded as successful (Fanirah, 2000)

The growing Client's demand in terms of quality and efficiency services and noted that; Clients nowadays expect more than a competent professional service, they expect quality regardless of what fee they are prepared to pay. That quality needs to be reflected not only in the end result but also in the management process and organization structure that brings it about.

Further, Duff & Thomas, (1989), observed that project success in traditional approach depends on sound project management team that is based on well-conceived strategic plans and effective project organizations

On one hand, project performance is the function of the Client, the project and procedure (roles, responsibilities, process of documentation and contractors selection) employed upon the project. Clients frequently use the Tradition project performance measures of cost, quality and time to measure performance (Nicholson, 1992).

On other hand project performance is a function of the interplay between project management team, the project organization and the Client's objectives. Project management teams always relies on contractual arrangements as the main vehicle for the formulation and regulation of the relationship between parties involved to achieve a high level of integration. In this complex situation, the reconciliation objectives of the various parties, and the identification and allocation of risks, are among the principal factors that facilitate the successful management of the relationship (Jaafari, 1994).

3. PROCUREMENT METHODS

Franks (1984) defines building procurement methods as: *"the amalgam of activities undertaken by the Client to obtain a building"*

This paper defines procurement method as sequence of activities and organization structure that defines roles and responsibility of each part to the contract, which eventually will be used to deliver a finished output.

3.1 The Tradition Building Procurement Method

The building procurement method that has been used in Tanzania is based on RIBA traditional approach. It is a form of contracting where Client appoints Architects and other professionals to provide the design select the Contractor and supervise the work through to completion. The Contractor is selected on a competitive basis. Most of the time the contracts allocated lump sum basis meaning that the price to be paid is agreed or fixed prior to letting the contract, the condition however may or may not contain provisions for an adjustment to the contract sum (Mkony, 1991).

Tradition Building Procurement Method (TBPM) indicated the clear separation between the design and construction teams in terms of responsibility, the client through his in-house professional team and his supervisor provides to the design team (architect, quantity surveyor, engineer, client and architect's supporting staff) all their requirement, the design team is responsible for converting those requirements into a conceptual drawings and upon clients satisfaction into production drawings. These drawings are issued to the construction team (contractor, sub-contractors and suppliers) for execution. TBPM has been the sole system and it is still dominating. The system originated in 19th century and was designed by traditional built environment professionals at the time when general Contractors began to emerge such as Cubbit in London in 1870.

However despite it's dominance and popularity in the building industry for more than a century, the TBPM has been criticized as being a poor building procurement method and it is blamed for the decline of industry's performance. It singled out the separation of design responsibility from construction responsibility as the main source of poor performance (Hower, 1995).

He added that traditional experience can no longer be taken for granted in meeting stakeholders expectations. The project invariably costs more, and a relative inferior product is delivered as TBPM is sought to place project objectives in the second place. According to Kamala, (2000), the TBPM is still dominant despite being criticized as being a poor method of delivering services.

3.2. Alternative Project Procurement Methods

Interests in Alternative Procurement Methods (APM) began in mid 1970's, when the oil producer's cartel OPEC was formed, resulting in a significant increase in the price of crude oil. This created economic crisis around the world and most non-producing countries experience double-digit inflation (Frank, 1984).

He added that, most industries were hit and the demand for buildings declined dramatically and all role players in the building industry were

affected. It caused building companies that were previously looking for an Architect or Engineer as the provider to find customers outside the TBPM. One of the obvious effects of deep reduction in demand of the buildings, was the corresponding increase in competition amongst service providers and different methods of selling and delivery of services were found.

It has been noted that the introduction of new procurement methods in developing countries, particularly in Tanzania is due to Client's demands, economic depression, and commercialization of Parastatal organizations, proliferation of in house professional team, increase in project complexity, expansion of private sector, information technology and technological transfer (Kamala, 2000). However unsuitable procurement systems, client design changes, late information, design errors, contractor planning and productivity can affect the project performance in term of cost, quality and time. The following necessitate the choice of APM.

- Client characteristics:
Different client characteristics such as level of sophistication, industrial clarification e.t.c, will generate varying criteria of satisfaction, priorities and expectation of completion within cost and time, which could influence the selection of methods.
- Project characteristics
Project characteristics may be distinguished by their level of contractual complexity. The more complex the project is, the wider the range of services and expertise needed and vice versa. It therefore requires different organization forms to optimize success in building projects
- Project procedure.
This element could influence the selection of the appropriate building team and subsequently affect the success of the project through the process of documentation and Contractor selection. The procedure envisaged for a project will influence the selection of contractual methods.

At present there are a number of new procurement methods in use in many developing countries, these includes: Design and Build, Turnkey or Package Deal, Project Management., Construction Management, Build-Operate-Transfer and management contracting. Whilst, most of them have been offered in the developed countries for some time, their use in developing countries is much more recent. The methods that have been developed and found appropriate in Europe have been imported directly into Africa without waiting for a similar system to evolve; they were introduced by international organization Clients who had opportunity to use procurement method elsewhere in business organization, (Kamala and Hindle, 2000).

Rwelamila *et al*, (1999) observe that, the emergency of new approaches in procurement in former colonial countries is often heralded, as panacea for all previous problems. Unfortunately, African construction industry professionals have the tendency of accepting them without

questioning their appropriateness of the systems to their environments. Essentially, the TBPM is in most African countries (primarily the English speaking countries) and is used as default system. There is little choice for project managers, to make any changes to the system that occur will probably be due to outside agencies, and will cause a risk of serious disruption to the project. These changes may be in regulations, union policy, markets, technological innovation etc. Thus, an appropriate procurement system is necessary for the project management in order to balance the project parameters and allocate risks appropriately.

It's the Client or his advisor, who decides on the procurement methods to use. However clients do not take into account and probably do not realize, that the greater the cost of and risk imposed on a Contractor by their procuring methods, the greater in the long run will be the cost of construction.

While both public and private Clients have remained at the receiving end of poor building projects, the procurement professionals in Africa has failed to articulate the fact that any system will clearly have inherent strengths, weaknesses, and attributes that will render it ideal for a given circumstances.

According to Rwelamila *et al*, (1999), the African professionals seem to react differently to this new tide of imported procurement methods. One section of professionals seems not to understand the source of the problems and their relationship with default TBPM practices. They feel that these new procurement systems are not suitable for the African CI's because professional organization structures are modelled on the TBPM structures, which according to them are working. The problems resulting from default TBPM practices are considered normal; and blames seem to fly between different professional organizations as the source of the problems. Another section seems to support whatever is suggested by Europeans, Japaneses and U.S.A professionals but without addressing the issue of contingent procurement strategies. Ideally, African professionals have not provided any theoretical framework on which to derive either an ideal or an optimal approach to procurement.

4. DATA COLLECTION METHODS

The target of the study was to involve 60 engineering and architectural consulting firms, 40 Clients and 20 Contractors. This was thought to be a fair representative sample. The basis for this is supported by Nicholson (1992), *"inferences based on subset of the whole aggregate might nonetheless be accurate"*. This suggests that it is difficult to collect data from all sources in question. It is rather difficult to experiment on partial

information that would represent the whole lot. This is being viewed from the experimentation practicalities.

For the case of this research, information was collected from different consultants in the field of construction, regulatory bodies like Architects and Quantity Surveyors Registration Board [AQRB], clients and from the websites and relevant journals.

Three main types of methodology were used in carrying out the research process namely use of secondary sources through desk studies of existing literature materials, interviews and use of administration of the questionnaires.

- Use of secondary sources for capturing secondary data involved going through published materials such as books, journals, Internet surfing and periodicals.
- Structured, semi- structured and unstructured interviews were carried out to different categories of people and sections of the sector for collecting primary data. These included consultants and clients within the construction industry. Interviews comprised of informal and formal discussions.
- In order to ensure the harnessing of information concerning the primary data questionnaires were administered to selected firms to capture information and views from respondents on how they have been trained, their current knowledge on alternative procurement methods and how the alternative procurement methods promote the success of the projects. The research questionnaire was divided into five parts. The first part was about the company profile. The second part of the questionnaire was intended to capture the knowledge, exposure and awareness of professionals and clients in the CI on the APM. Respondents were required to explain their awareness on APM and rate their extent of knowledge on APM. The third part of the questionnaire aimed at testing the capability of APM to deliver projects successfully. The respondents were to grade in terms of percentages, the extent of project success and to indicate whether or not the projects undertaken have been successful. They were also required to grade (in %) how different procurement method affected the projects, based on the provided performance indicators. Section four of the questionnaire inquired on the level of participation of consultants and clients as well as the criteria used on the choice of procurement method. It was also designed to detain their preference on APM. The final part of the questionnaire required respondents to give their opinions on the use of TBPM and APM.

5. FINDINGS

A total of 48 consulting firms and 15 Clients were covered in this study, although the target was to cover 60 and 20 number of Consultants/ Contractors and Clients respectively. However, for the purpose of this study, the covered firms form a fair representation. Among the surveyed firms, most of them have been doing the business for the period of between six to twenty years.

Table 1.1: Response Analysis

Item	Contractors		Consultants	Clients	Total
	Local	Foreign			
Target	20	10	30	20	80
Responses	16	8	24	15	70
% of Target	25%	12.5%	37.5%	25%	100%
% of respondents	20	10	30	19	79%

The views and opinions collected reflect the true situation of perceptions of Clients and Consultants on alternative procurement methods. The number of respondents in the study was limited by the geographical coverage of Tanzania, given the fact that consulting firms and Clients are found all over Tanzania. Given the time and resources constraints, Dar es Salaam city was only selected and seen as the place where major Clients and consulting firms are located. Even though, it could not be possible to cover every firm in the city. Still, some Clients and consulting firms were contacted but they were not willing to respond.

Collected raw data was sorted, coded and entered into a computer spreadsheet. The questions were analyzed using Microsoft Excel programme and produced the following results;

- Most of the Consultants/ Contractors and Clients are extracting their knowledge on APM through experience.
- The knowledge level through familiarization and experience is the key factor that influences the decision on the choice of particular method of procurement. It seems most of the professionals in the building industry are scared of making mistakes by undertaking unpredictable procedure.
- Project success depends on the organization structure and procedures employed upon it.
- The popularity of TBPM comes from the fact it is the one which has been in use since independence and the current Public

Procurement Act (2004) follows the same direction. Further, they said that stakeholders find it difficult to shift from the conservative TBPM to the use of modern APM.

- Socio economic context is accommodating TBPM because APM have been adopted from developed countries and they are not familiar in our context.
- In order to encourage the use of APM, it is useful to conduct training and to expose practitioners by giving them a chance to practice and to formulate law to regulate procurement.
- 82% of respondents indicate that APM has a greater contribution to the project success, if and only if it is appropriately applied depending on the project characteristics.
- Design and build is most preferred building procurement method compared to the rest the reason being familiarization, experience and skill level of construction professionals. Few of the respondents did not prefer the use of on some APM.
- The knowledge is not satisfactory to allow professionals to give out a clear decision that will benefit the developers in the long run.
- The knowledge is limited to certain APM due to the environment in our context that does not allow their applicability i.e. the law, regulation and familiarization.
- There is lack of guiding tools to enable proper selection of Project procurement methods.
- With the exception of Contractors, the procurement method of choice is the Traditional method, the reason being familiarization with the existing conventional Traditional procurement method.
- Most Clients require assistance in the selection of APM which they do not seek. That is apart from lack of knowledge on the APM, Consultants are not seen by Clients as a regular source of procurement selection advice.
- Advice from advisors and Consultants concerning procurement alternatives is largely confined to a limited selection of systems based on their experience and training knowledge.
- The selection of procurement method by the Client is invariably based on previous experience with similar projects.
- Knowledge of Clients and their professional advisors regarding the advantages and disadvantages of various procurement systems is only poor at best. This shortcoming explains the limited advice provided by advisors to the Client on procurement selection.

Table 1.2: Awareness of professionals on APM and participation on the choice of PM

Variables	Remarks
1) Knowledge On APM	Poor
2) Extent of awareness on	
1 Design and build	Very good
1 Management contracting	Average
2 Build operate transfer	Average
3 Construction management	Good
4 Turnkey	Average
5 Design and Manage	Poor
3) Participation on choice of Procurement Methods	Good

One of the objectives of this study was to benchmark and compare the projects' success when using the TBPM and the APM. Using a sample of thirty five (35) projects undertaken by eighteen (18) firms, the study established that APM perform better than the TBPM in several areas (see Fig 1.2 below). However, statistical test shows that APM only perform significantly better than TBPM in three areas: cost growth, turnover quality and delivery speed. Most interviewees who responded remarked that the success to the projects they undertook were mainly due to;

- Control exercised by the procurement method(s) used,
- Good management, and
- Good cash flow.

For the projects that were not successful, the mentioned reasons were;

- Cash flow problems were experienced in the projects undertaken by using TBPM; and
- Variations and delays by the contractor were experienced in Design and Manage procurement methods.

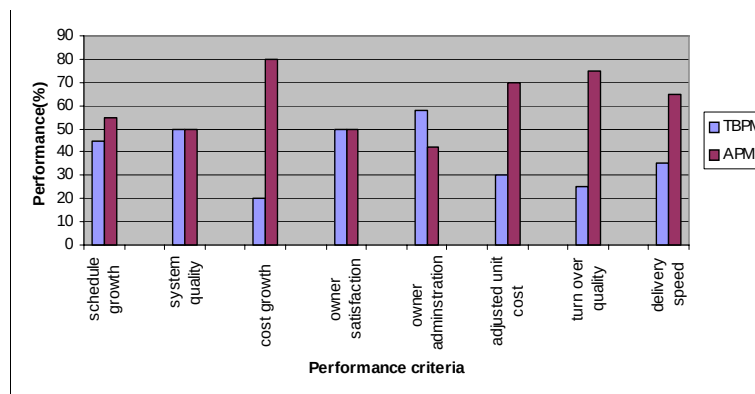


Figure 1.2: Performance comparison between TBPM and APM
Source: Field Work

6. CONCLUSIONS

Clearly, no one procurement method is applicable in all instances; being contingent on client type, procurement objectives and project characteristics. Professional advisors to private sector clients of the CI need to improve their management of the procurement process. More specifically, considerable room for improvement exists in the manner in which client briefing is undertaken, the process by which procurement methods are selected, and the effectiveness of time, cost and quality management in the attainment of client objectives. Procurement teams need to understand client goals and identify with those goals.

The public sector organizations studied, still largely use the conventional system and aim to deliver projects within budget, on time and at the specified quality levels. In addition, the current use of Public Procurement Act 2004 has reduce if not set aside the application of APM in Tanzania construction industry. In the more extreme cases there is a distinct gap between policy and practice that derives from the predominant use of the conventional procurement system and the difficulties associated with delivering socio-economic benefit via this system.

7. RECOMMENDATIONS

The CI is being blamed for poor quality and for run-way costs of its product. This phenomenon is direct reflection of the socio economic environment of the CI today an environment which is no longer characterised as it was forty years ago by crying need for improvement to meet the higher standard of living and to satisfy particular requirements of the society without economic penalties.

The APMs currently used in Tanzania seems to be of greater advantages when it is appropriately applied to a project. Now professionals are obliged to go one step forward to cope with these changes.

Some of data generated by this study has shown that most of the Clients and Consultants are not familiar with the current developments in CI. The continuous knowledge advancement programme should be introduced to Consultants and other practitioners through seminars, workshops and continuing education by bodies like the NCC, Construction Registration Board, Universities and professional bodies like Engineers Registration Board and Architects and Quantity Surveyors Registration Board.

As it can be discerned from the study that APM contribute to the project success, then it should be promoted by the government through its organs. The government should create a legal framework whereby APM can be practiced without any fear. This can be done by choosing the APM which suits our contextual environment.

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DELIVERING INFRASTRUCTURE DEVELOPMENT USING PPP/PFI: A CHALLENGE FOR ZAMBIA

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ABSTRACT

Purpose of this paper

Zambia like many other developing countries face a mammoth challenge in delivering infrastructure projects due to limited funding. With its dependence on foreign aid to finance part of its budgetary requirements, the provision of infrastructure has been very limited. However the use of Public - Private Partnerships/Private Finance Initiative (PPP/PFI) seems to provide a way-forward for the delivery of infrastructure. The aim of this paper is therefore to examine the key challenges Zambia faces in delivering infrastructure using the PPP/PFI approach.

Design/methodology/approach

The paper is based on a review of literature and a desk top study. A review of literature was conducted to determine critical success factors in PPP/PFI. Data from a desk top study was used to discuss the key challenges Zambia faces in light of the critical success factors.

Findings

The findings suggest that the key challenges include, legal and regulatory framework, procurement process, risk management and project financing.

Research limitations/implications (if applicable)

The discussion in this paper is based on literature review on PPP. Although this is the case, the paper provides useful preliminary discussion on the application of PPP in Zambia upon which further studies can be conducted.

Originality/value of paper

The paper provides useful information on the challenges and the institutional changes required if Zambia was to attract significant private involvement in infrastructure provision through PPP.

Keywords: PPP/PFI, Infrastructure development, Regulatory framework, project finance

1. INTRODUCTION

Zambia like many other developing countries is striving to meet its infrastructure development needs. However as the country relies on donor funding, the financing of such projects from the public purse becomes challenging. There have been calls for the enhancement of the use of Public-Private Partnerships (PPP) to procure infrastructure projects. The development of PPP/PFI in developing countries suggests that developing countries can benefit from this project approach. Although there have been some projects in the past which have been procured through PPP, it is inevitable that there will be an increase in the use of this approach.

However, there are a number of factors that need to be considered if future PPP projects are to succeed. For example, the newly developed policy on PPPs in Zambia is yet to be tested to find out if it will facilitate the successful delivery of projects through PPPs. It is also evident that although there are different models for PPP, Zambia is yet to discover the most suitable route because there hasn't been any detailed study to specifically identify the best PPP route for Zambia and many Sub-Sahara African countries.

The aim of this paper is to explore the potential challenges and benefits of using PPP to deliver infrastructure development in Zambia. The paper starts by discussing infrastructure development and the use of PPP. It then discusses the critical success factors in PPP and considers the key challenges and benefits from the use of this approach in the Zambian context.

2. INFRASTRUCTURE DEVELOPMENT

The importance of infrastructure investment is discussed widely in literature that it influences economic growth. Fedderke and Bogetić (2006) suggest that the influence of infrastructure is both direct, through capital

accumulation and indirect through total factor productivity gains. For example improvement in road networks increases accessibility and improves communication which would therefore facilitate growth by promoting private investments in an area. Grimsey and Lewis (2006) distinguish between for types of infrastructure projects including, energy, transport, water, telecommunication and social infrastructure projects (E.g schools, hospitals, police etc). The mentioned infrastructure projects are at most attractive because they are revenue dependant. However, social projects would depend on the arrangement between the public body and the private enterprise. This category of social projects the one that has a greater challenge.

Many countries in Sub-Sahara Africa (SSA) have an infrastructure gap. In order to narrow this gap most SSA countries would need to commit to 9%-13% of their GDP's for at least the next 8-10years (Estache 2005; Hammami et al 2006). The lack of adequate and quality infrastructure is evident in many Sub-Sahara African countries, including Zambia. Estache (2005) notes that the rate of access to quality infrastructure in developing countries remains relatively low when compared to other developed and emerging countries.

The need for initiatives to increase infrastructure investment to support economic growth in Zambia, COMESA and SADC region is acknowledged by the Governments. For example the Zambian government has called on SADC member countries to re-double their trans-boundary infrastructure investment efforts in order to support regional economic growth and integration (Times of Zambia 2008).

Zambia like many Sub-Sahara countries invested significant amounts of money immediately after their independence in 1964 to support economic development. However the level of investment has not been maintained. Several factors including the economic downturn during the 1970-1990s due to the drop in copper prices and the policy initiatives during the first republic (1964 – 1991) resulted in limited resources to improve infrastructure. This was compounded by the increase in population meaning need arose to upgrade the capacity of infrastructure. The World Bank (2002) note that one of the contributing factors for the infrastructure gap in Zambia is the over reliance on copper, as a main product to sustain economic growth. They note that following the country's independence a number of Cities were developed quickly with associated infrastructure. However due to the slump in copper prices, increase in urban migration, the developed infrastructure soon became inadequate, dilapidated and could not be maintained due to its high costs.

An example of such infrastructure facilities which have become incapable to cope with increased demand for use and quality is the main satellite telecommunication facility at Mwembeshi. The facility has been experiencing congestion of which there have been calls for it to be upgraded if consumer confidence was to be restored (CIO, 2008). Other areas that have deficits include public markets/trading areas, hospitals, Universities, Accommodation for University and college students, police

offices and housing units, sports stadiums/related facilities. The development of infrastructure has generally been the Zambian government's responsibility and much of it has been donor funded. The World Bank, IMF and other bilateral and multi-lateral donors have made significant contribution to infrastructure development in Zambia. The lack of resources is acknowledged by the Zambian government and has therefore challenged the private sector to participate in infrastructure development (Times of Zambia 2009)

3. PPP/PFI POTENTIAL

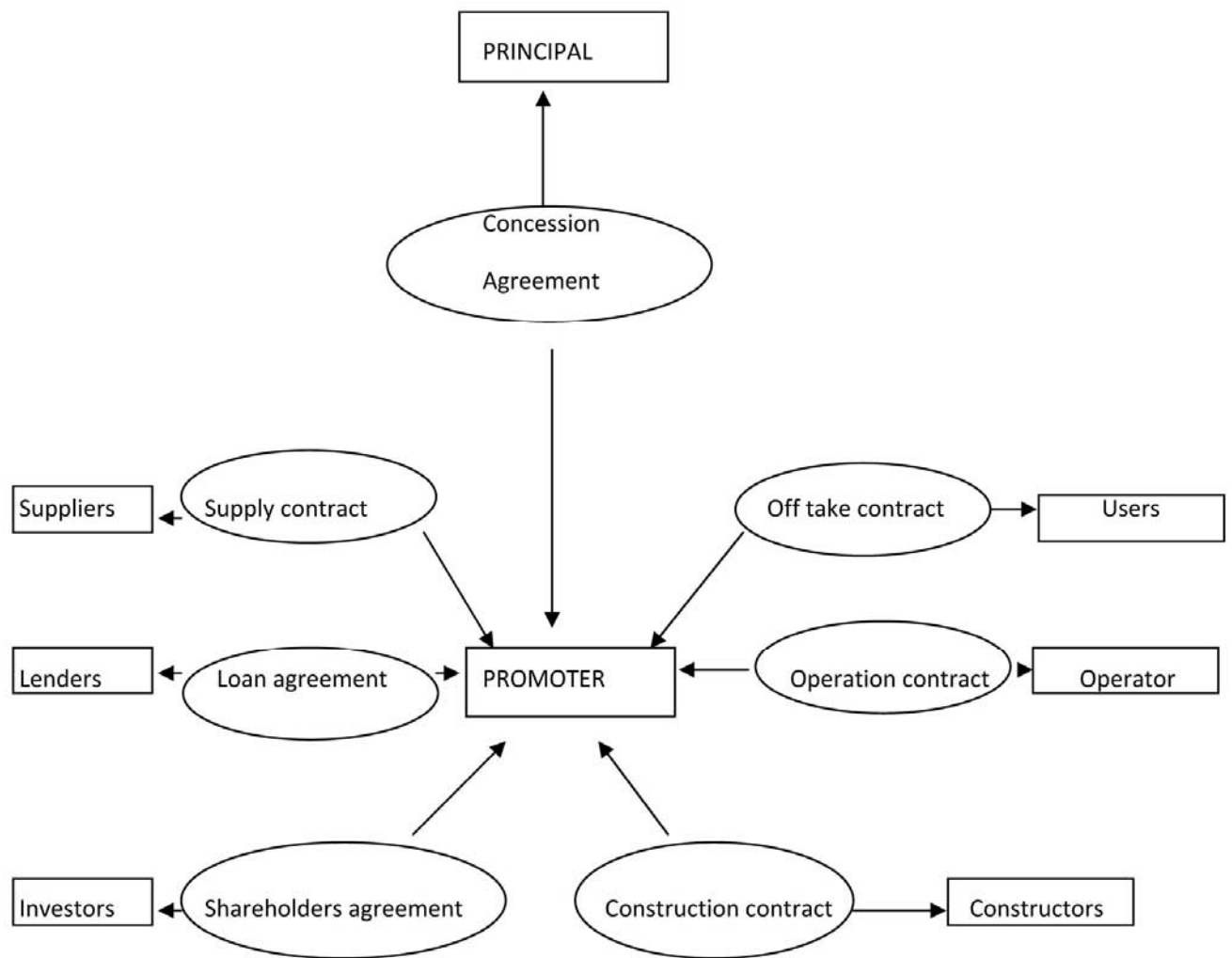
Public-Private Partnerships (PPP) is used to provide public sector projects using private sector resources. In general PPP involves the private sector in delivering public sector projects from the design, construction, financing, maintenance and operation under a long term contract. In return the public sector pays for the services provided. The argument for the use of PPP is that such an approach creates synergy of strengths between the public sector and the private sector through sharing of tasks and responsibilities, risks, incentives, innovation and long-term contractual relationships (Fischer et al 2006). The use of PPPs to deliver public sector projects has been embraced throughout the world with the United Kingdom being one of the forerunners in its use. The genesis of PPP in UK was under the PFI scheme (Turolla 2004), which was used to boost public sector investment programme. Hammani (2006) refers to PPP as a variety of financing and delivering approaches that create long-term relationships between the private sector and the public sector, while the UNECE (2008) describes PPP as a tool that is aimed at financing, designing, implementing and operating public sector facilities and services by the private sector. The most widely used forms of contracts for infrastructure projects as discussed by Bracey (2006) include:

- Design - Build - Operate (DBO): the private body designs, constructs, and operates the new facility for a set time frame usually 30 years.
- Build - Operate - Transfer (BOT): in this method the private body builds, finances and operates the facility for a specified time. However ownership of the facility is transferred to the public entity after the concession period.
- Build - Own - Operate (BOO): in this method the private sector builds, owns and operates the facility. The private sector assumes complete control of the project and therefore takes all associated risks.

The variety of these routes are very important even for a developing country like Zambia because they give provisions to financing different

types of projects apart from new construction such as rehabilitation and leasing. Other routes as discussed in Merna and Njiru (2002) are listed below:

- Finance - Build - Own - Operate – Transfer (FBOOT)
- Build – Own – Lease (BOL)
- Design – Build – Operate – Maintain (DBOM)
- Build – Rent – Transfer (BRT)
- Build – Transfer – Operate (BTO)
- Rehabilitate – Operate – Transfer (ROT)



Project financing structure from Merna and Smith (1996)

PPP SUPPORT MATRIX/TABLE

PPP SUPPORT FACTOR	DETAILS	AUTHOR
Specialised Contracts	There are many contracts as seen in the Project Financing Structure allowing specialized firms/organisations to undertake specialised works and tasks	Quiggin (1998)
Flexible mechanism	PPP provides an opportunity for the host government to own infrastructure after the concession period	Guistain and Michel (1995)
More efficient than government managed projects	Although governments borrow at lower costs to fund projects private management is better and more efficient	Klein and Roger (1995)
Significant reduction of pressure on public finance	Project finance international reported a 100% increase in infrastructure project in Asia and Australasia after the implementation PPP.	Merna T and Owen (1998)
Risk transference from the public sector to the private sector	This risk transference leaves the public sector with minimal and manageable investment risks	Merna T and Dubley (1998)
Variety and flexibility of financial instruments	Sources of finance for PPP range from debt, equity, loans, and guarantees. Some combinations of these can be swapped in order to maintain a healthy cash flow curve.	Merna T and Dubley (1998)

The benefits of PPP have been widely discussed in literature. Key to PPP is that it is used as a mode for infrastructure delivery as the public sector can now consider projects which otherwise would have been unaffordable (Hammani 2006). The approach is therefore widely seen as a promising avenue for infrastructure development in developing countries like Zambia, especially that it allows the public sector to spread the costs of the project as they only pay for infrastructure provisions as the services is provided. (Allard and Trabant 2007). With reduced public sector capacity to provide necessary infrastructure, due to funding constraints, most developing countries are looking to the private sector to help deliver necessary infrastructure. Allard & Trabant (2007) cites a number of benefits of PPP including the following; higher quality, cost and on time delivery, risk transfer, private sector management experience of otherwise complex projects and private sector innovation in planning for maintenance. Bracey (2006) note that the use of PPP allows the public sector to transfer risks to the private sector. However they note that the allocation of risks should be in such a way that the public sector and the private sector benefit from the project. Risk on PPP projects in developing countries is therefore a major determining factor for private sector involvement, especially foreign private company involvement. Although the use of PPP has been generating interest in developing countries, its use worldwide seem to have declined as investors have discovered that the risks associated with the projects are in many times costly (Bracey and Moldovan 2006)

The Zambian government in its 5th development plan (2006-2030) acknowledges the critical role that infrastructure plays in the social-economy development of the nation. Importantly, it acknowledges the role that the private sector can play in infrastructure provision. Through the development plan the government seeks to 'develop and implement an appropriate policy framework in order to facilitate effective private sector participation in the construction and maintenance of public infrastructure'. As such the PPP policy document and the proposed PPP bill formally welcome the role that PPP can play in infrastructure development.

Table 1 below shows the use of PPP in the SADC region with South Africa having the largest number of PPP projects since 1990. However Zambia has only had 6 PPP projects since 1990.

Table 1: Comparative data: PPP in SADC countries (Source World Bank, Internet)

Country	GNI	No. of PPP projects	Total investment
South Africa	5390	32	25341
Tanzania	350	21	2115
Mozambique	340	15	2241
Mauritius	5450	11	549
Madagascar	280	9	216
Congo Dem Rep.	130	7	915
Malawi	170	6	133
Zambia	630	6	944
Zimbabwe	-	5	841
Namibia	3230	5	104
Angola	180	5	834
Lesotho	1030	3	114
Seychelles	8650	3	94
Botswana	590	2	247
Swaziland	2430	1	53

4. KEY ASPECTS IN PPP: A CHALLENGE FOR ZAMBIA

While the use of PPP provides potential for a leap in infrastructure development in Zambia, there are a number of challenges that need to be addressed carefully. The issues include legal and regulatory constraints, risk management, procurement, capacity building and project financing. Fischer et al (2006) outlines the examples that are critical for successful PPP results and these include suitable legal frameworks, procurement process, coordinating and supportive authority and marketability and affordability. They advocate that the use of a task force to advocate for legislation changes, advise on policy issues and promote transparency and accountability is necessary for the development of effective PPP procurement in a country. Table 2 below summarises some of the conditions which support use of PPP.

Table 2: Factors influencing use of PPP

Factor	
Legal & Regulatory governance framework	Suitable legal framework
	Coordinated & supportive authority
	Institutional quality (e.g. less Corruption)
	Regulatory instability
	Appropriate procurement processes
Risk Management & Procurement	Previous experience of PPP
	Risk Management
	Marketability & affordability
	Market should be large enough to allow for cost recovery
Economics & Finance	Stable macroeconomics
	Aggregate demand is stable
	Cost of capital
	Availability of long term credit
	Inflation-price stability
	Attractive interest rates
	Availability of financial institutions

The UNECE's guidelines (UNECE 2008) introduced key PPP governance measures essential for implementation of PPP in 7 areas including policy, capacity-building, legal framework, risk-sharing, procurement, putting people first and the environment. Below are the key UNECE PPP principles (UNECE 2008);

- Principle 1 – The PPP process requires coherent policies that lay down clear objectives and principles, identifies projects, sets realistic targets and the means of achieving them, with the overall aim of winning the support of the population for the PPP approach.
- Principle 2 – Governments can build the necessary capacities in a combined approach which establishes new institutions and trains public officials while at the same time using external expertise.
- Principle 3 – Investors in PPPs need predictability and security in fewer, simpler and better rules. In addition, the legal account of the beneficiaries must empower them to participate in their rights and guaranteeing them access in decision-making.
- Principle 4 – PPPs allow risk which is most able to be managed by the private sector, to be transferred to them. However, governments also need to accept their share and help to mitigate risks allocated to the private sector in mutual support.
- Principle 5 – The selection of the bidder should be undertaken following a transparent, neutral and non-discriminatory selection

process that promotes competition and strikes a balance between the need to reduce the length of time and cost of the bid process and, acquiring the best proposal. Along these lines, corruption should be penalized as well.

- Principle 6 – The PPP process should put people first by increasing accountability and transparency in projects and through these improving people's livelihoods, especially the socially and economically disadvantaged.
- Principle 7 – The PPP process should integrate the principles of sustainable development into PPP projects, by reflecting environmental considerations in the objectives of the project, setting specifications and awarding projects to those bidders who fully match the green criteria.

Bracey and Moldovan (2006) recommend that in order for the public sector to manage risks on PPP projects, they should not view PPP only as a source of financing projects, but should provide an appropriate legal and regulatory framework to address risks in PPP projects. They suggest that the public sector should address a number of issues including an appropriate procurement process which is transparent and where award decisions are based on objective evaluation criteria; improving the regulatory environment and governance with appropriate human capital to manage the process. The financing of PPP projects can also be challenging for developing countries. This is particularly critical as investors in PPP projects are likely to make their decision based on political and regulatory risk and the ability of the projects to provide enough revenue to cover all costs (Castalia 2005). They suggest that even if the project would provide enough revenue to recoup the cost, political and regulatory risks would play a big part in the investor's decisions. Further, they argue that governments in most Sub Sahara African countries are worst payers and therefore this would undermine the revenue stability of the project. It is clear therefore that for PPP to be successful, the issues identified above should be adequately addressed or taken into account. While the list is not exhaustive, it reflects some of the key lessons learnt in other countries and therefore Zambia as well needs to address them if the application of PPP is to be successful.

5. CONTRIBUTION TO DEVELOPMENT

The successful implementation of PPP in Zambia would lead acquisition of more public infrastructure such schools, Universities, hospitals, public markets/trading areas. The development and delivery of essential public services and facilities would be accelerated as a result of utilisation of private resources in reducing the huge deficit in terms of public infrastructure and services.

6. DISCUSSION & CONCLUSIONS

The aim of this paper was to discuss some of the challenges Zambia faces in using PPP as a mode of delivering infrastructure projects. The use of PPP has potential benefits as it provides an opportunity for the public sector to consider projects which would otherwise have been too costly to procure. The Zambian government's initiative to encourage private participation in infrastructure development is in the right direction. However consideration needs to be given to many issues for it to be successful and realise the benefits of PPP. The aspects identified above are based on lessons learnt from other countries and also general PPP guidance.

The three key areas of legal and regulatory governance, risk management and procurement and economics and finance should be clearly addressed. On the legal and regulatory governance, we recommend that the institutional capacity for PPP be strengthened by establishing a 'PPP Watchdog' separate from the existing public procurement agencies to provide a platform for advice and best practice guidance on PPP.

The proposed management and monitoring of PPP projects under a public institution as stipulated in the Zambian PPP policy is likely to fail to deliver the intended results of the PPP. The unit under the public institute will not have the required capacity to monitor and analyse risks which include financial, technical, revenue, engineering, political and innovation. The management of risk and the general procurement process must be addressed further for possible revision. As discussed above, PPP can be used to offload all risks to the private sector; however this would come at a premium. It is imperative therefore that an appropriate risk management structure to be devised specific for the Zambian environment. In addition there is need to provide a transparent procurement process where decisions made should be based on clear and fair evaluation criteria. The use of private finance from the international market will continue to be challenging due to various reasons. However one of the challenges for private investors will be the guarantee of revenue risks to recoup back the investment. There is therefore a need to devise appropriate PPP finance structures to ensure that revenue risks are reduced while ensuring user affordability of possible charges.

Detailed customised structures, financial instruments, contracts and special project vehicles (Promoters) for each PPP must be appropriately worked out because each project is unique from the other. There is therefore great need to continuously improve the PPP policy document, develop the PPP bill and research further on how the PPP can be best introduced and implemented in Zambia in order to produce the best results out of the PPP which would richly benefit both the public and the private sectors, a win – win result.

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DELIVERING INFRASTRUCTURE AT SCALE IN DEVELOPING COUNTRIES: NUMBERS OR SYSTEMS?

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ABSTRACT AND KEYWORDS

Purpose

To present an alternative delivery model that can deliver infrastructure at scale within an African context.

Approach

Research as to how infrastructure could be delivered at scale without compromising the delivery of social and economic deliverables indicated that a fresh approach to delivery was required.

eThekweni Water and Sanitation implemented this fresh approach to delivery on a large scale project on a pilot basis. Framework contracts with a limited number of “supply chain” contractors were entered into to deliver infrastructure and a number of deliverables relating to poverty relief, enterprise development and training over a three period. Use was made of NEC3 Engineering and Construction Option C Target Contract and the CIDB specification for Social and Economic Deliverables in the Construction Works Contracts.

Findings

The pilot project not only delivers infrastructure at scale but also provides significant temporary employment opportunities to the unemployed, facilitates the growth and development of small local contractors and permits a wide range of training to take place. It requires only one eThekweni staff member to oversee its implementation.

Value

The delivery model demonstrates that framework arrangements with large contractors can not only delivery projects at scale but also on a wide range of social and economic deliverables.

Keywords: Target contract, infrastructure delivery, public sector, construction works

1. INTRODUCTION

The Construction Industry Development Board (CIDB), established as a statutory body to stimulate sustainable growth, reform and improvement of the construction sector, recognised that construction output within South Africa needed to double in size over a 5 to 10 year period to meet growing demand. It also acknowledged that several government departments and municipalities were struggling to spend their allotted capital budgets for a number of reasons. The CIDB (2006) in response to this challenge issued a practice note “Scaling up delivery and accelerating empowerment” which advocated the use of larger, longer contracts and the adoption of a programmatic and systematic approach to delivery.

The Expanded Public Works Programme (EPWP), one of the South African Government's short-to-medium term programmes aimed at alleviating poverty and reducing unemployment, spent about US\$ 360 million during the 2004 / 2005 financial year on infrastructure. The Expanded Public Works Support Programme (2006), a Project of the Business Trust, analysed the spending on these projects and found that on the 4478 municipal infrastructure grant projects registered with the Department of Provincial and Local Government, with a total value of US\$ 1,3 billion, the average size of projects was a mere US\$ 0,3 million, while only 2% of the projects exceeded US\$ 2 million. They also found that the average size of projects implemented by the provincial departments was US\$ 0,2 and only 1,4% of projects exceeded US\$ 2 million. Cabinet raised concerns about the small size, limited impact and limited visibility of these many EPWP projects.

The Business Trust commissioned the development of a new delivery model against this background. eThekweni Water and Sanitation Unit (Durban), with the support of the CIDB, piloted its implementation in the replacement of the city's asbestos cement water mains.

2. CURRENT PUBLIC SECTOR CONSTRAINTS TO INFRASTRUCTURE DELIVERY

2.1 The public sector skills shortage

Lawless (2005) found that there are no civil engineers, technologists or technicians whatsoever employed in 34% of South Africa's local municipalities and 9% of district municipalities. Only one civil technician was employed in 18% of the local municipalities and 9% of district municipalities while 16% of local municipalities and 13% of district municipalities employed only technologists and technicians under the age of 35. Only 19% of local municipalities and 53% of district municipalities have at least one civil engineer in their employ.

A rough comparison of the distribution of engineers and technologists in South Africa in 1967 and 2005 can be made by comparing the figures published by Terblanche (1971) and Lawless (2005), see Table 1. What is clearly evident from Table 1 is that there has been a major flow of technologists and engineers from the public sector to the consulting sector over time.

Table 1 Change in distribution of technologists and engineers in South Africa over time (after Terblanche (1971) and Lawless (2005))

Employer	Percentage distribution (%)	
	1967	2005
State owned enterprises	12	6
Government including provincial	12	4
Local government	15	10
Consultants	31	51
Industry or business	28	23
Academia	2	6

2.2 Current delivery practices

Virtually all public sector infrastructure projects in South Africa are currently delivered using a traditional preplanned approach to construction which requires that the design and specifications be adequately developed and approved by clients before tenders are invited. This approach enables the design to meet the client's requirements closely and the contract when awarded can proceed without major change, delay or disruption. This model works best when:

- the public authority has adequate in house capabilities and capacity to either undertake the design or to brief consultants and to oversee the design process; and
- there is adequate time to complete the design and associated documentation before tenders for construction are invited.

Public authorities are today under pressure to deliver projects, on time, on budget, within shorter time frames. This has led to the “fast tracking” of the traditional preplanned approach to construction by the streamlining of procedures to minimise delays between activities and to permit activities to be undertaken out of sequence. This has resulted in tenders for construction works being awarded where the works are not fully or precisely scoped. In many instances, this has led to very disappointing outcomes e.g. the final cost of the construction works for the 2010 world cup stadia has increased by approximately 100% from the time that tenders were awarded to the time that contracts will be completed.

Currently most public sector clients don't have internal design staff and outsource the design to consultants. Projects are commonly broken down into small contracts to provide access to local contractors and to encourage labour based technologies; the theory being that smaller contractors are best able to implement employment intensive works. This delivery model, however, results in a consultant driven, stop / start mode of delivery, often with disappointing outcomes.

2.3 Underlying reasons for current capacity constraints

The CIDB (2006) attributed the capacity problem within government to deliver infrastructure to:

- the project approach whereby, for each and every project, consultants are appointed, briefed, directed and overseen by a gradually disappearing cadre of skilled staff; and
- unbundling strategies aimed at reducing the size of contracts in order to target small or local enterprises in order to satisfy social and economic imperatives, which place increased demands on the client's resources to manage and oversee these small contracts.

It may be also be argued that capacity constraints exist due to the continued use of an delivery approach which no longer matches the capabilities and capacities of the client to effectively oversee its implementation, ignores the capabilities of the private sector and fails to accommodate current delivery imperatives.

3. THE SEARCH FOR AN ALTERNATIVE DELIVERY MODEL

Watermeyer *et al* (1998) demonstrated a little over a decade ago that a range of targeted procurement procedures developed in South Africa by government's Procurement Reform Task Team could be successfully used to link significant employment and business opportunities to large construction works contracts. In fact, these procedures have over time

become so well documented and developed that they have been incorporated into a number of South African national standards (Watermeyer, 2004) and are currently being converted into a series of international standards. As a result, there was no need to search for models and approaches to achieve social and economic deliverables through large construction contracts.

International approaches used by multilateral banks which are embedded in the conditions of contract published by FIDIC (2006) offered more of the same – the traditional pre-planned approach.

However, the approaches to infrastructure delivery adopted in the United Kingdom in the wake of a series of reports aimed at improving the efficiency of the UK construction industry e.g. Constructing the Team (Latham Report) and Rethinking Construction (Egan Report), did offer a number of alternative options.

The Office of Government Commerce's (2006) Common Minimum Standards require that procurement strategies and contract types support the development of collaborative relationships between the government client and its suppliers and facilitate the early appointment of integrated supply teams. This Standard also states that "traditional, non-integrated procurement approaches should not be used unless it can be clearly shown that they offer best value for money – this means, in practice they will seldom be used."

It was noted that the Office of Government Commerce has only endorsed the NEC family of contracts for use in public projects in the UK. An examination of the NEC3 Engineering and Construction Contract revealed that this form of contract not only provides a priced contract as is commonly the case in other forms of contract such as those promoted by development banks, but also a target contract, a cost reimbursable and a management contract option. The targeted procurement and NEC3 contracting system accordingly formed the basis for the alternative model that was developed.

4. THE MODEL

Typically at the commencement of any programme (series of projects), the only "knowns" are the allocated medium term budget, a list of short term priorities and possibly an indicative broad brush breakdown of the budget into prioritised projects for the first year of the programme. Individual projects within a programme need to be scoped, designed and documented so that construction may take place. This cycle needs to be

repeated so that as projects are identified, they can be scoped, designed and documented so that construction occurs on a continuous basis over the period of the programme (see Figure 1). Accordingly, the delivery model needs to be capable of procuring services in the absence of a well defined scope of work.

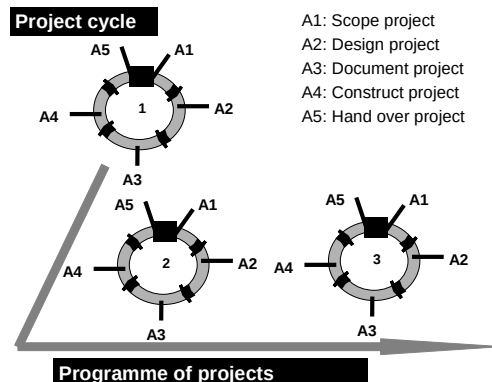


Figure 1 Project cycle within a programme of projects (Watermeyer *et al*, 2007)

In terms of this model, the client identifies a programme comprising a number of projects and obtains the necessary funding for it. The client thereafter procures the services of a Programme Manager and one or more Design Consultants and Contractors in terms of a competitive procurement process in the absence of any detailed scope of work using the NEC3 family of standard contracts published by the Institution of Civil Engineers, London (see Figure 2) and the CIDB Standard for Uniformity in Construction Procurement (Watermeyer *et al*, 2007).

The Programme Manager converts the budget into a series of works packages, manages the delivery of the works, acts as the Employer's Agent in terms of the Design Consultant's contracts, acts as the Project Manager in terms of the Contractor's contract and provides cost consultancy

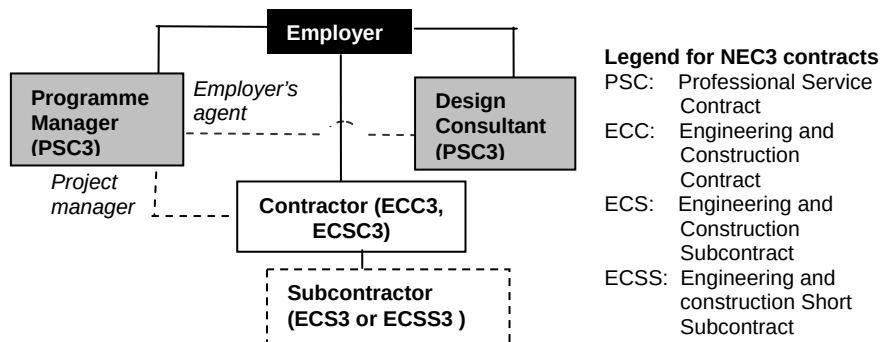


Figure 2 Contractual relationships in the model (Watermeyer *et al*, 2007)

services. The Design Consultant provides design services in relation to the identified work packages and monitors the quality of the constructed works. The Contractor constructs the works associated with an identified works package.

The Contractor, prior to commencing the work, agrees a target price with the Project Manager based on an activity schedule developed from the specifications and drawings provided by the Design Consultant for the identified package of work. During the course of the contract, the Contractor is paid his costs as defined in Option C of the NEC3 Engineering and Construction Contract, based on his tendered cost parameters and at the end of the contract, the Contractor is paid his share of the difference between the target price and his cost according to an agreed formula. If the final cost is greater than the target cost, the Contractor pays his share of the difference. This motivates the Contractor to control costs (Watermeyer 2009).

The Design Consultant is typically paid on a time and cost basis (Option E of the NEC3 Professional Service Contract) until such time as the precise scope of work is known and a target contract can be agreed with the Design Consultant (Option C).

Tenderers compete on the basis of price and quality for the programme management, design consultancy and construction services. Typically, the professional service providers tender staff rates and certain cost parameters relating to expenses while contractors tender a range of parameters associated with the NEC3 Schedule of Cost Components i.e.

- a direct fee percentage;
- a subcontracted fee percentage;
- time related charges for equipment;
- a percentage for working areas overheads;
- a percentage for manufacture and fabrication overheads;
- a percentage for design overheads; and
- hourly rates for specified personnel and equipment.

Tender assessment schedules are used to develop a comparative price for evaluation purposes, based on assumed quantities of hours and amounts and the tendered cost parameters (percentages and rates).

The CIDB's generic Specification for Social and Economic Deliverables in Construction Works Contracts (2007) can be used in conjunction with this model. This specification provides for the delivery of a wide range of social and economic deliverables through the performance of a construction contract as set out in Table 2.

The deliverables outlined in Table 2 may be readily incorporated into the scope of work associated with a particular work package by reference to this specification and the completion of project specific variables (specification data). Contractors may be required to achieve a particular deliverable and be penalised financially should they fail to do so or be offered a financial incentive should they equal or exceed a key performance indicator associated with a deliverable. The target price that is developed for each work package takes into account these requirements. This approach of addressing the social and economic agenda is very flexible and, unlike most other delivery models, allows the client to change the deliverables over time in response to emerging needs and changing circumstances. This is of particular value where the contracts extend over a few years.

5. THE PILOT PROJECT

eThekweni Water and Sanitation maintains some 13 000km of water mains in the Durban area of which about 2 500km are aging asbestos cement pipes. These old asbestos cement pipes are at the end of their useful life, burst frequently and need to be replaced. eThekweni adopted the delivery model outlined in this paper which allows the target price associated with each water district to be established once the scope of work and socio-economic deliverables have been finalized.

The concept of the model using Option C (Target Cost) of the NEC3 Engineering and Construction Contract was introduced to the Design Branch of eThekweni Water and Sanitation in February 2007. (The Branch had not previously used the NEC3 Form of Contract). The decision to proceed with the model was made mid February after a briefing meeting which was attended by select officials, contractors and consultants. Expressions of Interest were prepared in accordance with the CIDB's Standard for Uniformity in Construction Procurement, advertised on 9 March and closed on 23 March. Submissions were evaluated and the successful respondents were invited to proceed with the preparation of a tender in accordance with the CIDB's Standard Conditions of Tender on 7 May. Tenders for the Programme Manager and Design Consultants closed on 18 May and for the Contractors on 25 May.

From these tenders one Programme Manager, four Design Consultants and four Contractors were selected. These selections were ratified by the Bid Evaluation and Adjudication Committees and contracts were awarded during the last week of June 2007. Work commenced on 1 July 2007 i.e. the start of the new financial year.

Table 2 Standard social and economic deliverables

Theme	Deliverable	
	#	Description
Employment of local resources	A1	Provide employment opportunities to targeted labour
	A2	Utilise local resources
Employment opportunities in labour intensive works	B1	Provide employment and skills development opportunities to targeted labour
Business opportunities	C1	Provide business opportunities for targeted enterprises
	C2	Procure subcontractors for defined portions of the contract in terms of specified procedures
Enterprise support and development programmes	D1	Provide third party management support services to targeted contractors
	D2	Procure or manage (or both) mentoring services for targeted contractors
	D3	Execute the contract in joint venture with a targeted partner
Skills development	E1	Provide experiential work opportunities towards a specified professional registration for designated persons
	E2	Provide work learning opportunities towards a specified degree, diploma or certificate for designated persons
	E3	Provide experiential work opportunities towards a SAQA registered qualification or certificate for designated persons
	E4	Procure and manage a training provider to provide specific training for designated persons
HIV/AIDS	F1	Promote HIV/AIDS awareness

The construction works contracts that were concluded were for a three year period and were based on the NEC3 Engineering and Construction Target Contract option (Option C). The NEC3 Professional Service Contract was used for the appointment of the consultants. Use was made of the Construction Industry Development Board's (CIDB) Specification for Social and Economic Deliverables in Construction Works Contracts.

Water districts are assigned to specific consultants and contractors. The target price is negotiated with the contractor after the design of the water network is completed. Districts are handed over to contractors who become responsible for the maintenance of the existing pipe work in the district, including the repair of burst pipes, until such time that the new pipelines are installed, the old pipes are decommissioned and the district is handed back to eThekweni Water and Sanitation.

The learning curve on the project relating to the maintenance of the existing water network and the supplying of households with water while decommission the old pipes and commissioning the new ones was a steep one.

6. THE OUTCOMES OF THE PILOT PROJECT

Expenditure on this project from a standing start on 1 July 2007 up to 1 September 2008 was approximately US\$ 40 million. Currently up to 80 km of water mains are being replaced each month. Approximately 3800 temporary workers (unemployed persons) are employed on the programme to excavate trenches and are rotated every 4 months to allow others to financially benefit from the construction activities. The total amount of money paid to such workers is about 21% of total project expenditure. 16 subcontractors (or “co-contractors”) have been offered work opportunities. These contractors who have annual turnovers ranging from well below US\$ 75 000 to US\$ 550 000, are being developed to increase their share of the construction work from 10% to 20%.

A full time mentor has been engaged to assist the “co-contractors” in the establishing of business systems within their businesses in order to improve their sustainability and to grow their business. Key performance assessments of these contractors are undertaken by the mentor at regular intervals to monitor their progress. The expected annual turnovers of these co-contractors at the end of the contract is expected to be between US\$ 100 000 and US\$ 1 000 000.

Selected workers are provided with training in pipe laying. All workers received HIV/AIDS training. Work place experience is provided by the design consultants to enable eThekweni staff members to gain suitable experience to facilitate their registration as built environment professionals. eThekweni has only assigned one of its senior project managers to interface with the project team through the appointed programme manager.

7. APPLICABILITY OF MODEL TO OTHER AFRICAN COUNTRIES

Lawless (2005) attempted to quantify the technological challenge facing developing countries by providing an indication of the ratio of engineer to population, based on an extensive desk top survey and the contacting various institutions and registering bodies. Although the data was compiled from a number of sources of varying detail and reliability, the statistics, some of which are reproduced in Table 3, when linked to per capita gross national income, illustrate a linkage between the economy of a country and the number of qualified engineers per capita (Watermeyer, 2006).

Table 3 indicates that that despite the perception that South Africa is technologically stronger than other African countries that this is not necessarily the case. South Africa has a significantly higher per capita income than countries such as Tanzania and Namibia yet according to Lawless (2005) South Africa's ratio of population to engineer is not significantly better than Zimbabwe, Namibia and Tanzania and other less developed countries. Accordingly, there is no reason why the model should not be able to be applied in other developing countries within Africa.

Table 3: International registered engineer to population statistics

Country	Population per registered engineer (after Lawless, 2005)	per capita Gross National Income, US\$ (World Bank, 2005)
Norway, Finland, Denmark and Canada	≤200	28 390 to 52 030
Sweden, Germany, France and Ireland	201 to 300	30 090 to 35 770
Japan, UK, USA, Australia and Hong Kong	301 to 500	37 120 to 41 400
Malaysia and Chile	501 to 1 000	4 650 to 4 910
Singapore, Korea, Hungary and Romania	1 001 to 3 000	2 920 to 24 220
South Africa	3 001 to 5 000	3630
Sri Lanka, Tanzania, Namibia	5 001 to 7 500	330 to 2 370
Swaziland, Zambia and Ghana	≥12 000	380 to 1660

8. CONCLUSIONS

The implementation of the model on the pilot project has demonstrated that:

- allocated medium term budgets for a programme of works can be spent not only in a manner that results in construction works of an acceptable quality being delivered in response to prioritised needs, but also in a manner that contributes to the regional social and economic agenda including employment and skills development;
- it is possible to procure the services of a number of consultants and contractors to deliver a programme of works in the absence of a detailed scope of work within a public sector procurement regime;
- it is possible to mobilise a project team to tackle a large infrastructure project within a relatively short period of time once a decision is made to proceed with a project;
- long term, large contracts rather than short term small contacts permit service delivery to occur at scale;
- large, long term contracts can, effectively and efficiently deliver on a wide range of social and economic objectives; and
- the demands placed on a client for its implementation are minimal. .

The target contract approach whereby the target price is negotiated once the scope of work in a water district is known has provided the client with complete flexibility in deciding on priorities and has enabled a well structured and focussed contractor development programme to be implemented with clear and measureable outcomes. The scale of the project has allowed a focussed mentorship programme to be implemented to ensure that the targeted construction businesses put in place business systems to ensure that they grow in a sustainable manner.

This delivery model using large well established contractors has been able to deliver jobs to the unemployed efficiently and effectively. The money paid to such workers which amount to 21 % of total project cost in the early stages of the project where the start up cost are high, compares very favourably with the achievements of the well known Soweto's Contractor Development Programme which ran from 1988 to 1998. (Soweto's programme, which replaced secondary water mains, involved small labour only contractors and third party management support in the form of construction and materials management. This programme enabled 28 percent of the construction cost, excluding programme management and design and supervision costs, to be paid to small contractors. (Watermeyer *et al*, 1995). This is contrary to the popularly held belief that contracts should be made small to ensure that work is labour based and executed by small local contractors.

There are two distinctly different strategies to address the current lack of service delivery and poor project outcomes.

The first seeks to significantly increase the numbers of built environment professionals within government to effectively and efficiently manage and oversee the current approach to delivery. The second harnesses the capability and capacity of the built environment professionals located within the private sector to delivery infrastructure using a radically different delivery process.

The model which eThekweni has implemented harnesses the capability and capacity of the private sector to deliver and in so doing has dramatically reduced the staffing requirements of the client. As such it can offer a solution to overcoming capacity constraints in the public sector not only in South Africa but also in other developing countries in Africa.

The model's implementation has the potential to turn around the poor service delivery or non-delivery that is frequently encountered in developing countries.

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THE FUTURE AND SUSTAINABILITY OF PUBLIC PRIVATE PARTNERSHIPS (PPPs) IN AFRICA: CHALLENGES AND ISSUES

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ABSTRACT

Purpose of this paper

The purpose of this paper is to disseminate findings of a doctoral study conducted at the Nelson Mandela Metropolitan University (NMMU) relative to South African Public Private Partnership (PPP) projects. The objectives of the research are to: contribute to the PPP body of knowledge (PPPBOK); further understanding of the challenges facing and issues affecting delivery of PPP projects; promote the use of the PPP model in the implementation of projects in: Africa; Middle East, Asia, Far East, Europe, Latin America, Caribbean and North America.

Methodology / Scope

The output of the doctoral study conducted at the NMMU forms the basis of this paper. The research investigated perceptions of PPP stakeholders on the performance of operational PPP projects. A case study approach was adopted to examine various performance aspects of operational South African PPP projects. The research was a multi-case study design. Each individual case study consisted of a 'whole' study, in which facts were gathered from the selected PPP projects and conclusions drawn on those facts.

Findings

Findings from the research are reported in aggregate: Existence of a robust policy and regulatory framework; inadequate PPP training and project management capacity. Furthermore, based on the findings, appropriate recommendations were made for policy changes, decision making and improvements. Research findings continue to be published in local and international forum.

Value

Research findings that have been published continue to promote sharing of knowledge with the rest of the research community. Furthermore, publishing provides opportunities for further research in other areas relative to use of 'systems thinking approach' within the broader context of procurement systems.

Keywords: Sustainability, Public Private Partnerships, projects, challenges and issues.

1. INTRODUCTION

The systemic collapse of the financial systems in various sectors of world economies has raised fundamental concerns regarding critical challenges and issues which need continuous review and attention. The lack of appropriate infrastructure on the African continent, and associated inadequate resources reinforces the need for focus in this area. The African Development Bank, World Bank and affiliated institutions are working feverishly to boost confidence amongst investors for sustainability of the PPP sector.

Some of the interventions by the African and World Bank institutions include: direct equity and investment loans; encouraging of governments to introduce conducive legal and regulatory framework and technical assistance through training and consulting. Furthermore, it is imperative that PPP actors gain a deeper understanding of the various and evolve mitigative measures to protect the PPP sector from systemic collapse.

2. CHALLENGES AND ISSUES

According to the Business and Industry Advisory Committee (BIAC) (2004), the key factor that inhibited the proper implementation of PPPs over the past twenty years was the inadequacy of systems to protect lenders and investors from the risks of investing in developing countries. Furthermore, Subramanian and Haider (2004) have examined the landscape and benchmarks of the use of HIV and AIDS PPP programmes through PPPs in addressing the HIV and AIDS challenge.

Recent and past relevant examples have been drawn from various countries in Africa to illustrate the gravity of the problem that the African countries are facing. Where necessary, other examples from other continents will be used for benchmarking purposes in terms of: where the countries are; where they are going, and how they are managing the risks associated with the challenges and issues.

2.1 Politics

Political will is fundamental to a successful partnership programme. PPPs represent a significant change to the traditional procurement approach, and therefore governments need to build political support to facilitate PPP development and sustainability. Bad governance contributes to the development of a poor environment that is not conducive to investment.

2.2 Conflicts

Conflicts are normal during project implementation. Formal dispute resolution procedures should be put in place as an alternative to legal procedures and for an efficient and cost effective means of resolving issues that may arise during the contract.

2.3 Policies and Legislative Frameworks

PPP success and sustainability requires the right business environment. The lack of a transparent legal framework, at all levels, or legal uncertainty, due to non-existent and partial legal frameworks, can impede successful project implementation, as the private operator's ability to operate freely and efficiently is denied. This leads to stalled projects, delays in implementation and sub-optimal results, which ultimately deters future investors. Toolkits promote growth of PPPs (Public-Private Infrastructure Advisory Facility, 2003).

2.4 Pricing and Cost Recovery

Before PPP tenders are issued, the relevant PPP unit needs to determine, or refine the project's budget. In many cases, this is done by determining what the project would cost if it were built strictly by the public sector. This is done, so as to determine if the PPP will actually save money for the public, realise a significant improvement in service, or cost savings and cost recovery.

2.5 Technical and Management Capacity

Overseas Development Assistance (ODA) could facilitate Foreign Direct Investment (FDI), by helping developing countries to control and protect the outcomes of FDI investments in their countries. In terms of PPPs, ODA could be used to improve the local skills base in order to meet the demands of foreign investors, by educating and training civil servants in risk mitigation and efficient project monitoring. PPPs are becoming increasingly important in local economic development efforts of many cities (Walzer & Jacobs, 1998).

2.6 Financing

The financing landscape for private investment in developing countries has changed markedly over the years (Grimsey & Lewis, 2004). Structured project financing provides a vehicle for mobilising equity and debt in infrastructure projects. This is achieved by fashioning the finance needs to the specific project, with risks appropriately apportioned amongst different types of investors - equity holders and debt providers. Governments have many mechanisms for providing public goods and services. Many of these mechanisms involve partnerships with the private or non-profit sector (Forrer, et al, 2002).

2.7 Risk Management

A key principle of PPPs is that risk should be allocated to the party best able to manage it. The effective allocation of risk has a direct financial impact on the project, as it will result in lower overall project costs and will therefore provide enhanced value-for-money when compared to traditional procurement methods. The allocation of risk should reflect the specific characteristics of the project and the strengths of each party (Wibowo & Patria, 2007).

2.8 Corruption and Lack of Transparency

The more important the project and the less involvement by the local and international communities, the easier it is for corrupt practices to go unnoticed. The escalation of such practices can jeopardize the long-term financial feasibility of the project. Reich (2002) explains how relationships of trust are fostered and sustained in the face of the inevitable conflicts, uncertainties, and risks within a partnership.

2.9 Range of PPP Options

There is a broad range of options for involving the private sector in the financing, physical development, and operation of various projects. Traditionally, this has been the domain of the public sector. Many forms of PPPs exist and are continuously being developed to suit project characteristics. The main defining feature is the degree of private control over and involvement in financing. There appears to be no unique model. Each project should define what the most suitable and appropriate requirements are for it. Dewulf and Spiering (2006) provide an overview of developments in PPPs in different countries and address the various characteristics and approaches to PPPs.

2.10 Local Empowerment Programmes

Government economic empowerment programmes such as the BEE programme in South Africa need to be properly structured into PPP formats. South Africa offers an integrated technical assistance-financing package to black partners in the bidding consortia, who then seek to raise funds for the purchase of equity in the private party (Republic of South Africa, 2004).

2.11 Affordability

High PPP transaction costs have been identified as a major constraint in the development of PPPs (Republic of South Africa, 2004). Agencies such as the Project Development Facility have intervened to support PPP initiation in various sectors in South Africa through payment of transaction fees.

2.12 Unclear Objectives

A good PPP project should have clearly conceptualised objectives, which must be reviewed as a continuous function of the project management team. This will ensure that any threat to them is properly addressed. In order to work successfully with the private sector, public bodies need to be clear about the fundamental principles and objectives behind PPPs.

2.13 Misperceptions

The misperceptions that PPPs are a 'cure for all' should be addressed adequately. PPP is not the only method to deliver project financing and realization. It does not provide a 'miracle' solution, or a quick fix, and should only be used where appropriate and where it is able to deliver clear advantages and benefits.

2.14 Lack of information and poor communication

Lack of information and poor communication is a key obstacle to PPP growth in most countries. Relevant government information should be made available through electronic networks. Governments should upgrade their ICT infrastructure and tools, and train personnel to promote electronic information dissemination between the public and private sectors.

Extensive use should be made of the worldwide web and online information databases. The provision of all necessary information to all stakeholders will promote transparency and accountability. Government agencies should also make available PPP user manuals through CD_ROMS and via toll-free 0800 telephone numbers. Other approaches should include establishing dedicated PPP units and / or centres to promote and manage the PPP development process.

2.15 Competition

Competition creates an environment that encourages bidders to be innovative in their design solution and efficient in their service delivery. Governments should work with relevant PPP implementing agencies to reform existing laws, so as to remove legal and regulatory impediments to competition, while still safeguarding public interest.

2.16 Labour Movement Resistance

Most attempts to finance the building of new East European transport infrastructure by means of toll revenues have been abandoned, or put on hold (Von Hirschhausen, 2002). The legacy of free infrastructure under state planning has made it difficult to jump immediately to private project financing based on user charges.

The issue of the implementation of the Nelspruit Water Concession project is a good example, whereby the local municipal authorities had to engage in long protracted negotiations with representatives of the South African Municipal Workers Union (SAMWU) before eventually undertaking the project. For many years, the Confederation of South African Trade Unions (COSATU) was strongly opposed to municipal service privatisation. In the past, SAMWU said that it rejected PPPs, because it regarded them as a form of privatisation and it was opposed to the idea of public services being delivered for a profit (Niekerk, 1998).

2.17 Public acceptance

A broad public consensus regarding the involvement of the private sector in infrastructure is needed. This applies especially to the implementation of project financing models based on user charges.

2.18 Value-for-money

Factors determining value-for-money will obviously vary from project to project and between sectors. Generally, however, PPPs will generate value for improvements in a number of areas, including: reduced life cycle costs; better allocation of risks; faster implementation; improved service quality, and the generation of additional revenue.

2.19 Transaction Costs

Packaging and modelling of infrastructure projects involve high transaction and bidding costs. In a review of transaction costs in infrastructure, Klein, *et al* (1996) contends that these costs amount to between 5 and 10% of total costs. This is a prohibitive factor, since the burdens of these costs are transferred down to the taxpayer. Table 1 below shows projects funded by the Project Development Facility in South Africa (Republic of South Africa, 2004).

Table 1: PPP Projects Supported by PPIAF funding by March 2004.

Project	Value (R)
Northern Cape Office Accommodation	717 060
Free State Department of Health - Trompsburg & Ladybrand Hospitals	1 861 912
KZN Department of Transport - Vukuzakhe Plant Depot	1 081 011
Eastern Cape Department of Health - Pharmaceuticals	3 146 696
Eastern Cape Department of Health – Settlers and Port Alfred Hospitals	496 060
Western Cape Department of Health – Rehabilitation Centre	2 925 000
Total	10 227 739

Data Source: PPP Quarterly, 2004.

2.20 Accounting for PPPs

Determining the appropriate accounting treatment of PPPs has proven to be a complicated and controversial issue (Grimsey and Lewis, 2004). The main problem is: In whose books should the assets covered by a given agreement be reported?

2.21 Budgetary Constraints

In infrastructure projects, both capital and operating costs must be considered in developing a benchmark cost. Before a tender is issued, the agency responsible for the PPP needs to determine, or refine the project's budget. In many cases this is done by determining what the project would cost if it were built strictly by the public sector.

2.22 Taxation

A sound appreciation of the taxation ramifications is needed in any dealings with private sector entities. There is a need to introduce new tax incentives to spur PPP growth. Measures can include tax holidays, for specified periods, for the private sector investors.

2.23 Lack of incentives

Determining the private sector's willingness to participate depends on whether the risks and rewards inherent in providing the required outputs create a genuine business opportunity for the likely participants. It also depends on whether the banks and financial markets will support the proposal. Given that the responsibility for the design, construction and project management is allocated to the private party, an incentive is needed to keep the project on track and to prevent construction delays and cost overruns.

2.24 Consensus building

Political will is fundamental to a successful partnership programme. PPPs represent a significant change to traditional public procurement and a government needs to build political support before introducing a PPP programme.

2.25 Lack of international PPP standards

There is no international standard framework for PPP investments and similarly, no regionally harmonized framework for PPP in many countries. The absence of an overarching policy framework on investment initiatives in developing countries has led to the development of a multitude of

overlapping legislative frameworks. These have been arranged on an ad hoc basis and are often of questionable credibility. As a result, investments are unprotected, as no existing framework has legitimacy over any other.

2.26 Lack of cooperation and coordination of PPPs

There tends to be a lack of cooperation and coordination of work and responsibilities between investors and local communities. Besides government and other civil organizations, developing countries have many informal practices, such as the black market and informal employment that impact on the way things are undertaken in them. For a project to be successful in such an environment, the private sector must have a clear understanding of the informal frameworks in which it will be operating and how these frameworks will be affected by, and possibly affect the implementation of the project.

Informal practices are difficult to document and change, and thus the private operator must cooperate with local entities that are knowledgeable of, and have contacts within the system, to ensure project feasibility. In many cases, these realities have been overlooked and projects have been stalled and even cancelled in the first stages of the concession.

2.27 Insufficiency of Judicial Systems

Judicial systems in developing countries are often poorly equipped to handle disputes between foreign investors and host country governments. This is a major impediment to the leveraging of private investment. Capacity building action is essential to help establish clear, stable and reliable judicial systems that can provide security for foreign and local private investments.

2.28 Limited Number of PPP Operators

PPPs are a fairly new concept in most developing countries, which means there is a limited number of experienced operators who are in a position to operate the PPP service more cheaply and efficiently.

2.29 Inappropriateness of existing procurement systems

The continuing search for maximum value-for-money in construction work has led to focused attention upon the procurement process (Smith, Morledge & Kashiwagi, 2006). Traditional methods of procurement generally involve employers, or their agents designing the work required, prior to competitive tenders. The success of this approach depends mainly on the ability of the employer to adequately specify the project

requirements. Inaccurate representation of requirements to the tendering contractors, usually leads to disputes. Other factors affecting the procurement process are: the lack of involvement of the contractors in the project design; poor contractor capabilities; lack of ownership by the contractor; inadequate risk-sharing; poor management, and the lack of flexibility to meet changing project circumstances.

2.30 Roles of different Parties

The role and responsibilities of PPP parties change with increased private sector involvement. The most important of these is the transformation of the public sector role from operations to a management and regulatory function. This requires both the development of effective regulatory systems and monitoring practices. The government retains a permanent interest in the delivery of an asset or service. It is ultimately responsible for determining the objectives, seeing that outcomes are delivered to the required standards, providing an enabling environment and ensuring that public interest is safeguarded. The execution of many elements of service delivery is transferred to the private sector. Today, a significant land acquisition is rarely accomplished without at least one private and one public participant (Endicott, 1993).

2.31 PPP Knowledge and dissemination

PPPs require skills that are typically in short supply in public sector organizations in emerging markets. These are skills such as proficiency in writing output specifications, experience in negotiating contracts that underpin a project finance deal, and familiarity with the wide range of financing models used by investment institutions. Creating an effective construction industry strategy represents an attempt to address part of this problem (Rwelamila, 2002).

2.32 Lack of PPP Institutional Frameworks and Facilities

In many countries there is no legal framework for PPPs. A robust system of commercial laws needs to be in place. Private sector interests have to be protected under existing laws. PPP implementing agencies have to facilitate the involvement of the private sector in infrastructure projects or public utilities. Restrictions on public procurement may adversely affect the implementation of PPPs. Special approval is required for large public procurement contracts (American Chamber of Commerce, 2002).

2.33 Health, Safety and Environmental Issues

Health, safety and environmental issues play a vital role in the successful implementation of PPPs. They often play an essential role in terms of

acceptability of PPP projects and therefore need to be carefully addressed by the relevant authorities during public inquiries (Boeuf, 2003).

2.34 Management of PPP Projects and Contracts

The capacity and skills of public administrations have to be broadened to manage and negotiate successful PPP projects. Given the lack of project management competence in the development and control of private project financing, the public and private sectors should pool resources. The United Nations (2002) suggest that for PPPs to be promoted and used in the reconstruction of areas such as South East Europe, international government units and departments should be involved in a regional network. This will help to improve the capacity of these governments to facilitate projects.

2.35 Inadequate PPP awareness and training

The diffusion of PPP policy takes time, with the learning curve varying from sector to sector. Therefore, it is important to conduct a PPP awareness campaign and to train people to implement PPP projects across the various sectors. In South Africa, this awareness takes different forms, ranging from PPP foundation training, to workshops, to internship programmes for transaction advisors.

2.36 Poor PPP Project conceptualisations

The range of risks that could possibly jeopardise a project's feasibility is amplified when investing in developing countries. This is due to the uncertainty linked to unpredictable political, economic and environmental shocks. In all too many cases, investors refuse to get involved, realising the tremendous risk and the time and effort needed to get legislation changed during the preparation of a given project. Furthermore, the problem of poor project conceptualisation is aggravated by inadequate risk assessments and poor feasibility studies.

2.37 Poor PPP Project Implementation

Poor PPP project implementation can result from an inappropriate use of project management methodology over the course of the PPP life cycle. It can also be a result of slow deal flow, lack of transparency, poorly drafted PPP agreements, and inexperienced PPP Project Officers.

2.38 Traditional Procurement Systems

Traditional methods of procurement generally involve employers, or their agents designing or specifying in detail, the work required prior to

competitive tenders being invited (Morledge *et al*, 2006). The employer subsequently selects those tenders that appear to represent the best value-for-money, and then enters into some kind of contract for the construction work.

The contractual relationship that results from this traditional process is essentially that of supplier and customer. The employer decides in detail what he / she wants and the contractor simply constructs the work as designed. To be successful, the method depends upon the employers being able to specify their requirements in sufficient detail for the contractor to accurately price the work. Some practitioners and other built environment agencies are apparently still 'locked' in this model, and as a result, many are not willing to explore the immense options available through PPPs relative to project delivery.

2.39 Rising Demand for Services

According to Currie (2005), the South African government is facing a rising demand for acceleration of infrastructure development, due to the social and economic transformation process. The government is facing a skills crisis, mainly at the provincial and municipal council level. Such capacity constraints mean that a lot of funding meant for development remains unlocked or unutilised. It was proposed that the PPP model be utilised for procurement, in 2006, in order to avail much needed project financing and resource support.

The use of PPPs will stimulate growth in the construction sector and will also promote BEE, create employment, provide mandatory skills-training, curb the spread of informal settlements and reduce crime and poverty. Furthermore, Currie (2005) provided thrust to the research process, which is to investigate South African PPP projects, in order to gain a deeper understanding of the problems, opportunities and benefits associated with utilising the PPP approach in infrastructure development and maintenance.

2.40 Making PPPs work

PPPs have emerged as a more preferable, acceptable and beneficial alternative to privatisation for infrastructure development in developing countries (Anvuur & Kumaraswamy, 2006). However, the implementation of PPPs is faced with a number of challenges, which if not properly addressed may undermine their purpose. The challenges and issues include exclusion of local and small-scale construction firms, bundling of small projects to bigger packages and the level of funding, which limits the type of participant.

2.41 Infrastructure Maintenance

According to a study by Ng and Wong (2006), the maintenance of infrastructure facilities is a demanding and costly task. It can be a financial burden with a high workload that can become unmanageable for governments with limited resources. Government institutions are now using the PPP approach for infrastructure maintenance.

2.42 Risk Mitigation

Alencar and Filha (2006) conducted a study to establish the mechanisms for risk mitigation in PPP projects. The findings of their research indicate that market risk mitigation is not enough to accomplish private investments. The argument is that investment can only be mobilised if there is fair allocation of risks in the partnership.

2.43 Procurement Reforms

According to Male *et al* (2006), the construction industry in Ghana has undergone major reforms in the recent past. This was necessitated by huge amounts of unsustainable foreign debt, excessive budget deficits, enormous contractual payment arrears, poor construction performance, corruption and pressures from international financial institutions. This has forced the government to commit to a reform of public procurement procedures, which culminated in the passing of the Public Procurement Act (Republic of South Africa, 2003).

3. CONCLUSION

The PPP system faces a number of challenges which are global. The issues discussed in this paper require a systemic approach to minimise the risks associated with them. One major inhibiting factor is the inadequacy of systems to protect lenders and investors from the risks of investing in developing countries. The overarching concerns are issues related to: governance; transparency; conflicts; corruption; PPP standards; public acceptance, and PPP awareness and training.

Recent developments from the UK and USA relative to the failure of the 'economic systems' illustrate the gravity of the problem that the African countries are also facing. There is an urgent need to revisit the key issues highlighted in this paper to ensure sustainability and development of new PPP projects in Africa. 'Empty rhetoric' is necessary, but not sufficient to make PPPs work. Research and publications relative to various issues addressed in this paper.

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MANAGING THE RISKS ASSOCIATED WITH SCOPE CHANGES IN GUARANTEED MAXIMUM PRICE (GMP) CONTRACTS

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ABSTRACT

Purpose

This study's objective was to determine if prior definition of scope changes within contract clauses would be an effective form of risk management on GMP projects.

Design

The study evaluates a typical project executed under the GMP contract system in New Zealand. Information on the administration of the project was obtained from project documents; and consequently questionnaires administered to the key project participants. The questions produced both qualitative and quantitative data that formed the basis for suggested solution to managing risks on GMP projects.

Findings

Experiences gained on the case study project show that the performance of GMP contracts could be improved through clarity of the project scope prior to awards, and partly on the procedural arrangements that are in place for dealing with subsequent scope changes. However these are not panaceas to risk mitigation on GMP projects, but a commonality of objectives by project management and the supply chain to make it work.

Value

The study provides further insight into the applicability of GMP contracts and how scope changes during project design developments could be managed on construction projects.

Keywords: GMP; design development; scope change; risk management

1. INTRODUCTION

There has been considerable development in procurement systems as well as contractual arrangements in the construction industry. It will be correct to say that each developed system has its pros and cons and desired to meet specific circumstances. One which is gaining some measure of popularity is the Guaranteed Maximum Price (GMP) contract in New Zealand. Several notable sector projects that have been executed using this contract type include:

- The Auckland, Southland and Tauranga hospital projects in the health care sector;
- Auckland University of Technology's Business School project; and
- Stamford Plaza in Auckland and Northlands Mall in Christchurch in the commercial building sector.

Anecdotal evidence suggests that the implementation of these projects were without common controversies surrounding the administration of variations and scope changes. This leads one to the conclusion that it is improbable for a construction project to be completed without a review of its original contract price. The risks of cost over-run associated with traditional lump sum or design and build contract systems continue to exist in the GMP contract system and contract price changes are inevitable.

The current study therefore explores how the risks resulting from scope changes can be more effectively managed on GMP contracts. It reviews a typical project executed under the GMP contract system in New Zealand whilst also engaging the key project personnel on means by which problems that arose during the administration of the project could be better managed.

1.2 Brief Literature Review

The GMP contract system has generated interest in the construction industry. The idea that a project can deliver an end result that has not exceeded its original contract price (as suggested in the name GMP) has great appeal to most construction clients. GMP appears to be in contrast with traditional lump sum contracts where inevitably, the original price is exceeded after the first variation instruction.

GMP contracts are desired to provide a lump sum (or ceiling price) contract which cannot be exceeded, except the scope of the original intent is reviewed extensively (Gander & Hemsley, 1997; Haywood & Hall, 2002). Embedded in its agreed contract price are contingency provisions that take

cognisance of the risks associated with design development. Thus the GMP contracts are a combination of both cost reimbursement and a call option on the fixed price contract (Boukendour & Bah, 2001). The cost component of a GMP contract includes:

- Guaranteed design and construction sum for all basic costs, overhead expenses and profits.
- Provisional sum which is a budget allowance to cover risks including those of design development. This sum may be priced as a risk item by the contractor or may be a declared sum which will be controlled by the client and contractor.

The extent and specificity of design development is crucial to the success of GMP contracts system (Daphne, 2001; Henriod & Le Masurier, 2002; Patterson, 1999). The rationale is for the GMP system to provide greater certainty that an original contract price will not be exceeded. This may be difficult to achieve because most bids are based on partially completed designs which may have to be reviewed in the future. If the designs are at basic development levels before the award, certain salient cost-centres may not have been included in the original scope; conversely if the designs are complete before award, works that were not specified may not have been included. The certainty of a guaranteed maximum price is therefore in question (Daphne, 2001; Lewis, 1999). If a GMP contract is enforced then it would be extremely onerous on the contractor and will present a very high risk. If that risk was priced into the contract then the GMP is defeated since clients intent is to share in the contingencies. It would therefore seem that GMP contracts are never all-inclusive and variation claims could eventually throw the GMP out.

Three types of variations have been identified on GMP contracts (Martin, 2000), these are:

- Variations that increase or decrease the GMP price. These are scope change variations that will require the client to provide additional funds if there is an increase in the GMP. Examples include significant variation in building size, function and quality (Daphne, 2001);
- Variations that do not affect the GMP but affect the project cost. These are project cost variations that have been provided for against the design development contingencies or budget, and
- Nil cost variations which are variation instructions that clarify designs, but without any cost implications such as colour scheme.

Scope change variations are difficult to administer because of conflicts that may result from its interpretation (Cairns, 2002). The tendency is for contractors to regard a variation instruction to be a scope change (Daphne, 2001) rather than those that can be expended from the design development contingency. The client on the other hand, wishes the opposite i.e. that all variations be project cost variations. Considerable amount of flexibility and willingness is required from both parties to the GMP contract for a negotiated agreement on how variations should be treated.

Several studies (Davis & Stevenson, 2004; Gander & Hemsley, 1997; Martin, 2000) have indicated that proper scope documents need to be

carefully developed so that parties are aware of the project requirements. Clarity of the project scope and what issues will constitute a scope change or project cost variation should be defined from the outset to minimise differences concerning their administration. There has to be an agreement by parties to the GMP contract on the circumstances by which price will increase (Lucas, 1998).

2. THE RESEARCH

2.1 Research Objective

The objective of the current study is to determine if prior definition of scope changes within construction contract clauses would be an effective means of managing the risks of contract price changes on GMP projects. A hospital project that was executed using the GMP contract system in New Zealand was selected as a case study. Project information was obtained from project documents; and consequent interviews held with the main project participants. The interview was based on a semi-structured questionnaire with questions referring to GMP definition; benefits and dis-benefits; and suggested solutions that could make GMP contracts achieve more relevance.

2.2 Description of the Case Study Project

The case study is a 29 month hospital project built in Invercargill, New Zealand between 2002 and 2004. It had an approximate contract value of NZ\$60m. The project was executed under a partnership agreement with three main objectives: to ensure that the client derives the maximum benefit from a team approach; to ensure smooth operation of the contract; and facilitate prompt and constructive resolution of disputes.

The contract conditions did not define design development and its make up. However it defined scope change or scope amendment which would have to be directed by the Technical Project Manager (TPM) thus:

- Increase, decrease, addition to or omission of any project requirements;
- Change in character or quality of any material or work or change in level, line position or dimensions of any part of the project requirements, and
- Change in sequence or duration of any part of the works that can be shown by the contractor to have materially impacted the time/or cost of completing the works.

The partnership arrangement permitted the main contractor to review all consultants' instructions and then advise the TPM as to whether they are a scope change or project cost variation. There were two levels of redress where parties are in disagreement: at the level of the GMP contract issues meeting that is held regularly amongst project team members; and at the Governance level involving project stakeholders (financiers).

2.3 Analysis and Presentation of Research Result

A semi-structured questionnaire was administered to the key project participants that make up the project management team. There were eight participants in the survey and they include the Technical Project Manager and Professional Quantity Surveyor on the client's side; and from the contractor's side the Project Manager, Construction Manager, Site Manager, Financial Controller, Quantity Surveyor and the GMP Estimator.

The questionnaire had three main parts: respondents' demographic details, general questions on GMP, and specific questions relating to the project. Specific questions that were asked about the case study project originated from project information e.g. minutes, correspondences etc. that had been obtained previously. Details are not included in this paper.

The questions produced both qualitative and quantitative data. The qualitative data consists of respondents' opinions to open-ended questions while the quantitative data is principally opinions that were analysed in this case using mean item score method to rank some of the responses.

Question 1 - Describe GMP contracts in simple terms.

All the respondents (n=8) agreed that GMP was a maximum price, which could not be exceeded. Three of them (40%) referred to the maximum price as being based on a determined 'scope of works' with one explaining that the GMP price could increase if there was a change in scope. Half of the respondents (n=4) are of the opinion that GMP prices are based on partially completed documentation and unresolved details.

A respondent offered that GMP prices are agreed between two parties with the project based on an 'open book' arrangement with a savings scheme included to motivate the contractor to achieve an increase in margin if there was a saving on the agreed GMP. The same respondent felt that the GMP contract process included 'partnering' as an essential part of the contract.

Question 2 – Definition of design development

Respondents ranked the definition of design development provided to them in the questionnaire in the following order.

Table 30.1 Respondents definition of design development

No	Definition	Rank
(a)	It is the budget to forecast the incomplete design of a project	1
(b)	It is the contractors estimating contingency to cover the lack of detail when pricing the original GMP documentation	2
(c)	It is the change that is imperative for the component system to meet its functional purpose	3

Question 3 – Definition of scope change

Respondents ranked the definition of scope change/amendment provided to them in the questionnaire in the following order.

Table 30.2 Respondents definition of scope change

No	Definition	Rank
(a)	Increase, decrease, addition to, or omission of any project requirement	1
(b)	Change in character or quality of any material or work or change in level, line position or dimensions of any part of the project requirements	2
(c)	Change in sequence or duration of the works that can be shown by the contractor to have materially impacted the time / cost of completing works	3

One respondent opined that the changes in scope could be as those defined by the contract, but may be subject to an agreement on what constitutes a change in scope. The respondent also added that the intent of the scope of works was vital and would influence future discussions on scope changes.

Question 4 – Respondents' preferences for GMP contracts.

There was general preference (n=6) for GMP contracts above other traditional forms of contract provided there was sufficient time for full design documents to have been produced prior to the pricing stage. GMP was noted by one respondent to be more suited to large and complex projects.

Some respondents believe that the GMP contracts could result in a 'win win' situation especially where there is an established relationship between the parties to the contract.

Question 5 – Could the inclusion of specific clauses on scope change and development have resolved contractual issues experienced on the case study project?

Response to this question was inconclusive because 40% (n=3) believe that the inclusion of special clauses in the contract could not have prevented the contentious issues surrounding scope changes and variations. The argument put forward is that scope changes would always be contentious no matter the type of contract involved. In fact it was suggested that the extent or value of the scope change claims determines the level of dispute that could result from any contract type.

Two respondents (25%) suggest that the absence of these clauses contributed to the problems encountered during the administration of scope changes and variations on the project. The remaining participants abstained from answering this question.

Question 6 – How could scope change issues be mitigated on this or future GMP projects?

There was general agreement that scope change and design development need to be well defined in GMP contracts. The provision of examples of what might constitute scope change that could affect the GMP were also suggested. Some of the respondents (n=3) however, were sceptical about giving such examples as disputes could arise from the interpretation of other issues outside those provided for in the contract. Along similar lines a respondent suggested the drawing up of 'risk schedules' that unambiguously state the risk responsibilities of the parties to the GMP contract. Similar risk schedules were prepared for the case study project as a means of improving GMP contract performance.

Generally respondents (n=5) are of the opinion that partnering was key to the resolution of issues arising from scope changes and variations on the case study project; and was the reason for the effectiveness of the project team. Others (n=3) believed it was the personality of the project participants (in terms of their ability to reach amicable settlements) rather than the contractual terms or conditions that could mitigate scope change issues.

Five of the respondents are of the opinion that the novation of the design team could positively influence the administration of scope changes as the contractors would have more certainty and control over potential risks from incomplete designs. In novation, contractors have more influence on the designs than in traditional forms of contracts.

The alternative viewpoint (n=3) is that contractors' could negatively influence the outcome of designs to suit their own interests thus negating the benefits of a GMP or of novation for that matter.

Question 7 – How scope change issues were resolved on the case study project?

There were four main steps taken to resolve scope change issues on the case study project. It was noted that none of the scope change issues went beyond the project management committee to the governance committee. The reason given for this was the partnering agreement between project teams.

The scope change resolution steps taken are outlined as follows:

- Notification of scope change by the Financial Controller;
- Discussion at two-weekly scope review meeting, reasons for scope changes tabled;
- Review by riders and discussed at the next scope review meeting, and
- If there is no agreement, the Financial Controller is to submit written submission with break up information which was reviewed and commented on by the riders.

Question 8 – General comments on suitability of GMP contracts.

Respondents were required to comment freely on the suitability of GMP contracts. The general opinion was that GMP contracts could be successful. One respondent opined that the GMP contracts were suitable considering that the case study project was completed on time and under budget. The client was satisfied with the final outcome and the contractor's margin was assured. The respondents believed that the GMP permitted better management of risks on both parties to the contract through a negotiation process that would decide which aspects should be expended using the design development budget and other aspects that the client will have to raise funds to cover above the original GMP.

3. CONCLUSION

The paper has reviewed some of the challenges associated with the administration of GMP contracts and especially how risks from scope changes can be effectively managed to facilitate construction project execution. Participants on a case study project were confronted with general and specific questions relating to scope change administration on that project. While there were general agreements on the benefits that could be derived from a firm price offered by the GMP, it is yet unclear how this firm price can be guaranteed.

Scope changes and variations are inevitable inasmuch as designs are never completed before project pricing. A first step maybe to progress the design as far as possible before final decisions on GMPs are reached. In this way the magnitude of design development risks are reduced and parties to a contract can price with more certainty. Novation of design consultants may be beneficial in this regard only when there is an agreement between parties to the contract.

The development and inclusion of standard clauses within contract conditions that will clarify the threshold of scope changes is another means of reducing disagreements on the administration of scope changes on GMP contracts. Such clauses will give more clarity on the scope changes that could affect the GMP and those that would be taken up by the design development budget. The clauses could also specify the procedure for its administration under these circumstances.

There seems not to be a panacea to contentious problems associated with the administration of scope changes on GMP contracts or any contract type. What is needed is a sincerity of purpose, commonality of objectives by project management and the supply chain to ensure that whatever approach is decided results in a 'win win' for all.

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REDUCTION OF NON VALUE ADDING ACTIVITIES ASSOCIATED WITH VARIATION ORDERS THROUGH LEAN AND AGILE THINKING

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ABSTRACT

Purpose

This study is a pilot one investigating the existence of waste arising from variation orders and its reduction by means of lean and agile concepts.

Design/methodology/approach

A literature review focused on exploring the conceptual definitions of lean and agile concepts and their merits as well. Closed-ended and open-ended questions were posed and sent to purposive sampled registered nationwide project managers. Statistical data outputs were generated using SPSS and subsequently analysed.

Findings

It was revealed that by embracing lean concepts relating to preventive measures of work interruptions, among other unambiguous briefing of scope of works and complete contractual documents before construction would reduce the occurrence of variation orders. By adopting agile concepts consisting of flexibility in incorporating a variation order in a schedule of works would achieve optimum use of resources.

Research limitations/implications

The survey was conveniently done on registered project managers. Stratified sample including other professional construction industry stakeholders would have generated more insight on the subject matter.

Practical implications

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The study increases the awareness of theoretical waste reduction concepts that contribute to prevention of the occurrence of variation orders and optimum administration of variation orders.

Originality/value

The study explores lean and agile approaches which if embraced will reduce non-value adding activities; hence the reduction of the overall construction delivery costs.

Keywords: Agile, lean, non value-adding, variation orders, waste

1. INTRODUCTION

Given a well-structured schedule of works, maximum project performance would be achieved if the work invariably flows smoothly within time limits and anticipated budget constraints. However, it is rare that projects perform precisely in line with their original schedule due to reasons such as, for example, business condition changes, delivery slips and corrections to design (Al-Hakim, 2005a,b). Consequently, changes are expected in any construction contract and these must be incorporated within the schedule of works. Typically, changes are variation orders that occur during the construction stage. A variation order is any modification to the contractual terms of a project by the client or the client's representative (Arain and Pheng, 2005). Ssegawa *et al.* (2002) asserted that the presence of variation clause in contracts amounts to admitting that no project can be completed without changes. Given that variation orders are expected to occur in most construction projects, a clause authorising variation orders is inserted in contractual documents. Resultantly, a variation order constitutes a formal decision to alter a previous one which affects the work or objectives of the other members of the project team (Bennett, 1985). Variation orders do not alter the contract as a whole but they become an *addendum* to the contract and integrated within time and work schedules.

A study on the impact of variation orders on project performance revealed that most variation orders were beneficial rather than being detrimental (Ndiokubwayo, 2008). Beneficial variation orders improve the value of the project while detrimental variation orders compromise it. However, no matter how beneficial a variation order is, some waste accrues on it as a result (Ndiokubwayo, 2008). Waste or non value-adding activities included demolition and alteration of aborted works due to variation orders. Arguably, the study confined itself to uncovering the origins of variation orders and potentiality for their reduction; however, management concepts for waste reduction were not widely discussed. The current study explores management concepts for waste reduction used in manufacturing industry by investigating their potentiality of reduction of waste associated with variation orders. Typically, lean and agile paradigms will be explored.

While leanness requires elimination of all forms of waste including such as for example time and the implementation of a level of a schedule, agility requires the use of market knowledge and a virtual corporation to benefit from rapidly changing market condition (Naylor *et al.*, 1999). Leanness is essentially concerned with efficient use of resources through minimization of waste or non value-adding activities (Narasimhan *et al.*, 2006) of construction operations. Agility has the ability to respond to sudden changes and meet widely varied customer requirements in terms of price, specification, quality, quantity and delivery (Prince and Kay, 2003).

2. LEAN AND AGILE MANAGEMENT CONCEPTS

Many recent management concepts for waste reduction used in manufacturing industry have potential for use in the construction industry. An example is lean manufacturing also referred to as Just-In-Time (JIT) approach which is a method of pulling work forward from one process to another (Ballard and Howell, 1995). Its objective is to maximize value and minimize waste. Allen (2000) defined lean manufacturing as a system approach where each phase builds upon the previous one, anchoring the system as a whole. Leadership, technical components and value-adding activity must be balanced, blended and synchronized (Allen, 2000). Similarly, Howell (1999) indicated that lean construction has the goal of better meeting customer needs while using lesser resources. Construction works are scheduled in a manner of a supply chain and waste is eliminated from the whole value stream. However, Ballard and Howell (1995) argued that the application of JIT in manufacturing differs substantially from construction because they present as different types of production mechanisms; hence, greater complexity, uncertainty and flow variation in construction. Arguably, the construction industry still lags behind owing to the characteristics that distinguish it from manufacturing industry. According to Ashworth (1998), characteristics of the construction industry include:

- The physical nature of the product;
- The product is normally manufactured on the employer's premises, that is to say the construction site;
- Projects that are one-off designs and therefore no prototype model is available;
- The industry has been arranged in such a way that design has normally been separated from construction;
- The organisation of the construction process and
- The methods used for price determination.

While lean manufacturing successfully achieves its objective through a streamlined and continuously running process, lean construction suffers the interruption of the flow of activities along the critical path partly due to

variations. In construction terms, interruptions could be variation orders as they are integrated within the schedule of works and executed. Where interruption occurs, waste elimination would be still achievable through agile concept. The agile approach involves being able to respond quickly and effectively to the current configuration of market demand (Brown and Bessant, 2003). The agility concept recognizes that change is inevitable during a construction project and therefore embraces it as an opportunity for enhancing customer-perceived value (Owen *et al.*, 2006). According to Chen *et al.* (2007) agility aims at promoting a better understanding of project complexity through decomposition and emphasizes the adaptability of a project system to ever changing environments. Brown and Bessant (2003) identified that agility management approach hinged around questions such as what, when, how, where and who. Arguably, the incorporation of a variation order within a schedule of works is seen as an agile concept since a number of questions will have to be answered prior to its execution. For example, the execution of a variation order requires to know involved trades and works (what), a convenient time (when) to start works, required technical skills, materials and equipment (how), the location (where) and parties affected (who) by the ordered change.

3. REDUCTION OF WASTE THROUGH LEAN AND AGILE THINKING

Given that there is waste associated with variation orders, lean construction achieves waste reduction by preventing variation orders from occurring. Variation orders interrupt original work schedule as they are issued. Alwi, Hampson and Mohamed (2002) noted that uncertain flow into conversion process contribute to expansion of non value-adding activities or waste. Thomas *et al.* (2002) believed that a focus on reducing work variability may lead to improved work performance by increasing throughput. Bennett (1985) concluded that controlling and seeking to eliminate variation orders was an important part of construction project management. Koushki *et al.* (2005) revealed that clients who spent more time and money on the design phase issued less variation orders than those who allocated insufficient time and money on this phase. Among other preventive measures to minimise their occurrence, the following were suggested (Ndiokubwayo, 2008):

- Adequate planning in advance by all involved parties before work start on site;
- Working drawings and contract documents should be complete at tender stage;
- Client to provide clear brief of the scope of works;
- All parties should forecast to overview unforeseen situation;
- Closer consultant consultation is required at design stage;

- Works should be supervised by an experienced and dedicated supervisor and
- Get accurate information and research with regard to procurement procedure, material and plant.

Agile construction is concerned with minimising waste of a variation order as it is incorporate within a schedule of works. Waste minimisation is achieved when involved parties are flexible enough to effectively deal with the change. Hence, problems arising from inefficient administration of variation orders are optimally dealt with. Formoso *et al.* (1999) indicated that waste occur as a result of inefficient use of equipment, materials, labour or capital in large quantities than those considered as necessary in the production of buildings. Harbans (2003) asserted that valuation of variation orders while seen as an administrative step in remuneration of changes effected to the contract, it is in reality rather a complex matter involving a thorough understanding of contractual provisions, costing principle and an exercise of fair judgement on the part of the valuers. Sweeney (1998) advised that on every project, participants should keep an eye open on problems. Thomas *et al.* (2002) suggested that flexibility in responding to variability can lead to improved performance by permitting rapid changes as needed. Flexibility in administering variation orders would involve efficiency in dealing with problems created with variation orders. These problems include (Ndiokubwayo, 2008):

- Discrepancies between the amount claimed by the contractor and the one certified by the consultant;
- Difficulties on ascertainment of impact of variation orders on schedule of works and subsequent required time for extension;
- Reluctance of clients to accept additional cost to compensate a variation order;
- Different opinions on judgment or lack of understanding of variation order administration process;
- Late or no payment on variation orders;
- Problem to know costs covered by a variation order;
- Problems related to availability of plant, experienced labour, quality and workmanship and
- Conflicts and disputes between parties to the contract.

4. METHODOLOGY

The study consists of a pilot investigation at what extent lean and agile managerial concepts are embraced in achieving waste minimisation in administering variation orders in South African construction industry. The literature review explores the conceptual definition of lean and agile concepts. A non-random sampling method was judged to be most suitable for the study given experience in subject matter and representativeness of participants. Namely a purposive sampling for respondents was adopted

whereby all registered countrywide project managers were contacted by e-mail. Both closed-ended and open-ended questions were posed. Closed-ended questions were captured using SPSS (Statistical Package for Social Scientists) and subsequently analysed. Internal consistency reliability for scale questions was determined. Inter-item reliability is relevant for measures which consist of more than one item and assesses the degree of consistency among the items on a scale (Fellows and Liu, 2008). Pallant (2005) suggested that Cronbach's alpha coefficient of scale should be equal or greater than 0.7. Open-ended questions were posed to gather opinions in relation to whether a standardised form of recording variation orders could reduce problems encountered with when administering variation orders. Also the discrepancies between the amount claimed by the contractor and one certified by the consultant lead to problems were questioned. The analysis of responses was carefully arranged in narrative form.

5. FINDINGS

5.1. Research participation

A questionnaire was sent by e-mail to countrywide registered project managers. The list was obtained from one of the registered project managers. This data gathering method yields low response rate; however it was adopted due to time frames allocated to the study. Out of 192 e-mails sent to registered project managers, 36 were not delivered. Out of 156 e-mails delivered to respondents, 28 (17.9%) respondents completed and returned questionnaires. Their companies included main contractor (10.7%), architects (7.1%), consulting engineering (3.6%), project management (67.9%) and developer (10.7%). The positions of the respondents within their respective organizations included directors (25.9%), project managers (25.9%), managing directors (22.2%), chief executive officers (7.4%), Bid and risk managers (3.7%), manager (3.7%), construction managers (3.7%) estimators (3.7%) and sole proprietor (3.7%). The experience of respondents in the construction industry ranged from 5 years to 50 years. The median length of experience in construction industry was 10 years. While respondents had been in their present companies for a period ranging from 2 years 6 months to 30 years, the median length of time they had worked there was 5 years. Their experience in their present positions ranged from 1 year to 30 years. The median experience in their current positions was 5 years. All respondents had been involved in administration of variation orders. The calculated Cronbach's alpha coefficient of reliability of scale questions was 0.9, hence the reliability of the study.

5.2 Discussion of findings

5.2.1 Reasons for occurrence of variation orders

There are several reasons influencing the occurrence of variation orders. Table 1 shows a 5 point Likert scale determining to what extent respondents agreed with given statements about reasons for the occurrence of variation orders, namely Strongly disagree = 1; Disagree = 2; Neutral = 3; Agree = 4; and Strongly agree = 5. Among other reasons, most respondents agreed clients provided unclear and ambiguous brief of the scope of works (85.8%), there was a lack of closer consultant coordination at design stage (89.3%) and consultant did not producing complete working and contract drawing at tender stage (78.6%).

Evidently, there was waste arising from variation orders in construction projects in South African construction industry. Especially the behaviour of parties to the contract at the design stage was an indication of potentiality of the occurrence of variation orders. Clients were blamed of providing ambiguous brief of scope of works while consultants did not produce complete working drawings. Unlike traditional procurement methods whereby works would start when all plans are complete; these days, there is a proliferation of fast tack contracts. Arguably, clients seek shorter pre-construction time resulting in designers not producing complete drawings at tender stage. Given a shorter time allocated to pre-construction stage, design in isolation and inefficient communication between parties regarding to changes, it would be hardly possible to forecast unforeseen changes. Consequently, interruption of the schedule of works would be expected. However, the study revealed that the information regarding the availability of materials and plant was well documented and had little influence on the occurrence of variation orders.

Table 1 Reasons for occurrence of variation orders

Reason	N	1 %	2 %	3 %	4 %	5 %	Mean	SD	Rank
Client providing unclear and ambiguous brief of the scope of works	28	0.0	7.1	7.1	42.9	42.9	4.2	0.9	1
The lack of closer consultant coordination at design stage	28	0.0	3.6	7.1	60.7	28.6	4.1	0.7	2
Consultant not producing complete working and contract drawings at tender stage	28	0.0	10.7	10.7	35.7	42.9	4.1	1.0	3
Any changes not being properly communicated to all affected parties	28	0.0	3.6	14.3	60.7	21.4	4.0	0.7	4
Inadequate time spent on the pre-tender planning phase	28	0.0	10.7	14.3	35.7	39.3	4.0	1.0	5
Parties to the contract failing to forecast unforeseen situations	28	0.0	7.1	17.9	57.1	17.9	3.9	0.8	6

Works not undertaken by a technically knowledgeable contractor who can foresee and timeously report any probable changes	27	0.0	7.4	18.5	55.6	18.5	3.9	0.8	6
Parties to the contract not being proactive all times	28	0.0	14.3	17.9	35.7	32.1	3.9	1.0	8
Project team members working in isolation	27	3.7	18.5	7.4	51.9	18.5	3.6	1.1	9
A poorly documented selection of an appropriate procurement method	27	0.0	18.5	25.9	48.1	7.4	3.4	0.9	10
Inaccurate information regarding the availability of materials	27	3.7	18.5	37.0	29.6	11.1	3.2	1.0	11
Inaccurate information regarding the availability of plant	27	7.4	25.9	37.0	22.2	7.4	3.0	1.1	12

5.2.2 Situations leading to problems when administering variation orders

There are problems encountered with when administering variation orders. Table 2 shows a 5 point Likert scale determining to what extent respondents agreed with given statements about situations that lead to problems when administering variation orders, namely Strongly disagree = 1; Disagree = 2; Neutral = 3; Agree = 4; and Strongly agree = 5. Among other reasons, most respondents agreed delays were experienced due to lack of timely decisions about approval of ordered changes (92.9%), lack of clear communication about cost implications of a variation order to affected parties (78.5%) and lack of common understanding of the process and contractual provisions for administration of variation orders (85.7%).

Table 2 Situations leading to problems when administering variation orders

Reason	N	1 %	2 %	3 %	4 %	5 %	Mean	SD	Rank
Delays due to lack of timeous decisions about approval of ordered changes	28	0.0	3.6	3.6	53.6	39.3	4.2	0.7	1
Lack of communication about cost implications of a variation order to affected parties	28	0.0	0.0	17.9	46.4	32.1	4.1	0.8	2
Lack of common understanding of the process and contractual provisions for administration of variation orders	28	0.0	10.7	3.6	53.6	32.1	4.1	0.9	3
Inefficiency of flow of information among parties to the contract	28	0.0	7.1	25.0	53.6	14.3	3.8	0.8	4
Variation orders are not optimally dealt with because of the lack of an experienced supervisor	28	3.6	10.7	10.7	64.3	10.7	3.7	1.0	5

Discrepancies between the amount claimed by the contractor and the one certified by a consultant	28	3.6	25.0	10.7	42.9	17.9	3.5	1.2	6
The lack of a standardised form of recording variation orders	28	3.6	25.0	10.7	46.4	14.3	3.4	1.1	7
Variation orders are issued with little consideration of the availability of hands-on skills	28	3.6	21.4	32.1	32.1	10.7	3.3	1.0	8
Late payment to the contractor on charges of variation orders	28	0.0	21.4	39.3	28.6	10.7	3.3	1.0	8
Variation orders are issued with little consideration of the availability of material	28	3.6	21.4	35.7	32.1	7.1	3.2	1.0	10
A variation order was carried out but incurred costs were not paid at all	28	7.1	28.6	14.3	35.7	14.3	3.2	1.2	11
Variation orders are issued with little consideration of the availability of plant	27	7.4	18.5	44.4	25.9	3.7	3.0	1.0	12

The study revealed a delay in approval of variation orders. Impliedly, clients drag their feet in approving unforeseen changes ordered by consultants. The lack of communication about cost implications of a variation order to affected parties or inefficiency flow of information among parties to the contract and common understanding of the process and contractual were often encountered problems. This suggests the need of improvement of communication among all participant parties to the contract. Whenever a variation order is issued, agile concept questions should be answered with regard to knowing involved trades and works (what), convenient time (when) for starting works, required technical skills, materials and equipment (how), location (where) and parties affected (who) by the ordered change. The more flexible are parties to the contract, the more is eased the administration of a variation order. It was alleged that variation orders were not optimally dealt with owing little experience of works supervisors. Though experience issue might be debatable, works should be supervised by a dedicated supervisor who can forecast potential changes. As reported, discrepancies existed between the amount claimed by the contractor and one certified by the clients; this confirms that checking and understanding the contractor's valuation method for variation order might be time consuming to the consultant. Given that there is no common standard form of recording and valuation of variations agreed upon all parties to the contract, a misunderstanding on the amounts would be expected. Late payment to the contractor, availability of plant, materials and labour as a result of variation orders were found to have little adverse impact.

5.2.3 Standardised form of recording variation orders

Respondents were asked to give their opinions in relation to the lack of standardisation in recording variation orders leading to problematic situations. It was revealed that there was no standard form produced by a client or a consultant. Even when a contractor drew one up but that did not make it any easier to obtain client's authorisation. Moreover, it was indicated that though some contractors had standard systems in place, unfortunately, correct procedures were rarely followed. Contentedly, contractors often produced their own variation order forms with various sub-conditions and terms which clients were not familiar with. Such conditions resulted in conflict and legal implications if accepted. It was alleged that various consultants did not understand correct procedures. Site instructions were not clearly defined in contract procedure. It was believed that due to every consultant and contractor using a different system of recording variation orders it took a long time before one understood how the administration system worked. Parties did not discuss the format at the beginning of the project and agreed on the procedure. Time constraints often made it difficult to thoroughly interrogate a full implication of a variation order with all parties before implementing it.

On one hand, respondents suggested there could be a system in place: a principal agent must set up the proper procedures for issuing and administration of contract instructions. This includes a properly numbered contract instruction book and agreement as to whom has the authority to issue the instruction i.e. a lead consultant in that discipline. Instructions must also be signed by the consultant and contractor and be counter-signed by the principal agent at the time of issue. Important issues such as for example methodology, plant availability, resources and programming should be debated and understood. If the instruction has a cost implication, such cost must be confirmed and this must be addressed before works commence. Some respondents revealed that they had a standardised site instruction format of which they have never encountered any problem. It was viewed a standardised form of recording variation orders would make it easier because people are lazy. It was suggested that the form should be detailed to cover full description of required work and the timing. On the other hand, respondents viewed a standardised form was not important. What is important is that details, relevant information and authorisation of variation orders should be recorded.

5.2.4 Discrepancies between the claimed and certified amounts

Respondents were asked to give their opinions with regards to the discrepancies between the amount claimed by the contractor and the one certified by the consultant. It was indicated that varied work was always required very urgently, therefore making it difficult to have cost authorised prior to completion of works. It was revealed that two parties had different

approaches of costing variation orders and much time was wasted in resolving the gap. Discrepancies occurred due to limited understanding of contract costs by the consultant or the contractor. Often instructions given were not clearer enough to allow for correct procedures when it came to settling the final account or certification. Contractors failed to negotiate cost of a variation order prior to commencement of works. It was pointed out that contractors took the advantage to overcharge on variation orders. Contractors often chanced their arms by claiming unrealistic or unreasonably amount for variations probably because they tried to maximise profit and minimise losses. Contractors invariably attempted to put higher mark-ups on variation orders and in several cases this was well justified. It was believed that contractors were normally wrong because they wanted more money but did not go back to priced bills. Problems arose relating to variation orders issued by the consultant without getting budget approval thereof. Often mark-up and preliminaries and generals portions were causes of problems. Grounds to adjustment of preliminaries and generals and extension of time due to variation orders were not often properly defined and explained to contractors. Contractors had a tendency of over claiming on variation orders in most circumstances and more often than not disputing the amount certified due to failure of producing required documentation at an early stage. On consulting team side, it was complained that design team members were also often unrealistic as they tried to minimise additional costs for the client. They did not understand production processes or the contractor's problems. Cost consultants were hesitant to report to the clients the effects of variation orders specifically where there were budget constraints. It was alleged that cost consultants did not always track contract costs or heed the main contractor's warnings of contract cost overruns.

It was reported that discrepancies often happened and resulted in disputes. It was recommended that the consultant and the contractor must agree on the amount before a variation order was submitted. Communication and negotiation should be the way to resolve this. At time of issue, there should be an understanding regarding the cost implications relating to the instruction. There must be a basis in the bill to agree the cost either by comparison or negotiation. For example if there is a change in concrete type for a particular element, agree first on the cost of concrete, placing methodology, delivery and formwork requirements. If there is agreement by all parties, including the quantity surveyor there can be no problem with the certification of the amount.

7. CONCLUSIONS

The study explored situations yielding work interruptions. These included unclear brief of scope of works and incomplete contractual documents. It is anticipated that paying particular attention to such situations will lead to minimisation of the occurrence variation orders, hence waste minimisation. Typically, a successful minimisation of variation orders is an achievement of lean concepts. Given that variation orders are expected in construction projects; where changes are effected, waste is eliminated by solving problems encountered with when administering variation orders. Efficient communication between concerned parties with regard to changes is encouraged. Parties should be proactive all times and flexible to accommodate changes; hence respond to sudden changes by means of agility thinking.

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THE NEED TO REDUCE COSTS, SCHEDULE OVERRUNS AND QUALITY SHORTFALLS IN CONSTRUCTION

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ABSTRACT

Purpose of this paper

This paper highlights significant causes of cost escalation, schedule overruns and quality shortfalls and proposes mechanisms that would systematically address the causal factors.

Design/Methodology/Approach

The study method included the use of literature review and structured interviews. Literature review focussed on bringing to light what other researchers have done on the subject while structured interviews were used to obtain the general views of the construction industry in Zambia.

Findings

Schedule overruns were found to be the major common cause of cost escalation. On the other hand, poor project planning and management was found to be the major cause of schedule overruns while corruption was attributed to be the major cause of quality shortfalls in construction projects.

Practical Implications

The paper identifies knowledge gaps in the construction industry which have to be narrowed by both academic staff and construction managers. It also presents a basis for which improvements and future studies on the subject may be conducted.

Keywords: cost escalation, schedule overruns, quality shortfalls

1. INTRODUCTION

Construction is one of the main drivers of Growth Domestic Product (GDP) in Zambia. Required investment, especially in developing countries, needs to be supported by the provision of sustainable infrastructure through the construction industry. For the last few years, the construction industry has been one of the fastest growing sectors in Zambia, recording the highest contribution of 10.4% towards GDP in 2007 (CSO, 2008).

The performance of the construction sector has an effect on other aspects of the national economy. Figure 1 presents the schematic diagram that shows the interrelations amongst the various sectors of a nation's economy.

There has been a general trend of construction projects not being completed in time, cost or to the expected level of quality (Kaliba *et al*, 2008). Cost escalation, schedule overrun and quality shortfalls seem to offset the benefits that are supposed to be derived from construction projects.

Cost escalation and schedule overruns has been the subject of discussion for many decades now (Merewitz 1973). Various factors that contribute to cost escalation and schedule overruns have been identified in literature.

In the project life cycle, the most influential factors affecting the outcome of a construction project often reside at the early stages. During the early phases of a project, decisions should be based on competent economic evaluation with due consideration for adequate financing, the prevailing social and regulatory environment, and technological considerations (Hendrickson and Au, 2003).

As noted by Cross (1952), it is customary to think of engineering as part of a trilogy: pure science; applied science; and engineering. It needs emphasis that this trilogy is only one of a triad of trilogies into which engineering fits. This first is pure science, applied science and engineering; the second is economic theory, finance and engineering; and the third is social relations, industrial relations and engineering. Many engineering problems are as closely allied to social problems as they are to pure science. It is therefore important to understand these social challenges and find appropriate solutions that would minimize or where possible eliminate the problems associated with the management of construction projects.

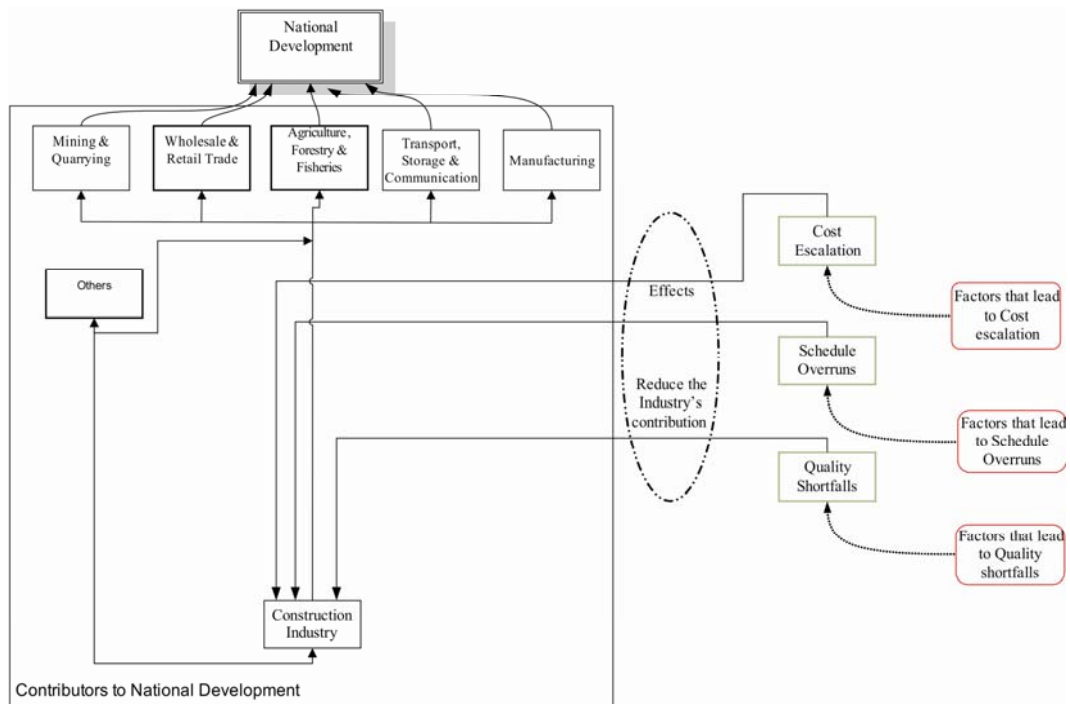


Figure 1: Relation Diagram

Predicting and understanding the problems before they occur, doing careful planning to avoid any of them and adopting appropriate solutions when they actually come into existence is possible when fore-knowledge of which ones are most likely to occur in construction projects is available. This assessment would help in combating construction problems with more preparedness even before they actually occur (Toor and Ogunlana, 2006).

There is a wide range of views for causes of quality shortfall, schedule delays and cost escalations in engineering and construction projects. Some are attributable to a single party, others can be ascribed to several quarters, and many relate more to systemic faults or deficiencies rather than to a group or groups of people. The successful execution of construction projects and keeping them within estimated cost and prescribed schedules depend on a methodology that requires sound engineering judgment (Hancher and Rowings, 1981).

1.1 Research aim and objectives

The study was aimed at finding ways of enhancing sustainable construction through the reduced prevalence of cost escalation, schedule overruns and quality shortfalls. The specific objectives included:

- To determine the prevalence of cost escalation, schedule overruns and quality shortfalls;
- Determine the causal factors for cost escalation, schedule overruns and quality shortfalls;
- Assess the availability of strategies or policies, contractual methods, contractual provisions and their adequacy;
- Identify measures for reducing cost escalation, schedule overruns and quality shortfalls.

1.2 Research Methodology

The research methodology in the reported study evolved around the need to address the aim and objectives of the study. It was considered essential to obtain a full understanding of the challenges besetting construction by setting out the various elements in a logical sequence, so as to avoid misunderstanding at any point in the research. In order to present clear perspectives about the causes of cost escalation, schedule overruns and quality shortfalls in construction projects and to bring out the effects, it was decided to conduct the study in two phases, the first being a comprehensive literature review and the second being data collection through structured interviews and questionnaire survey. The combination of the various methods was done to enhance the confidence that can be placed on the research findings (Spector 1981).

Literature review focussed on bringing to light what other researchers have done on the subject. The main objective throughout the literature review stage was to identify some of the factors likely to be relevant in studying cost escalation, schedule overruns and quality shortfalls.

Structured interview and questionnaire survey questions were structured based on literature review findings. This paper focuses on the findings from the structured interviews.

2. INTERVIEW DATA AND ANALYSIS

Structured interviews were conducted between July and August 2008. The interviews were preliminary in nature and targeted fifteen professionals working for contractors, consultants, clients or financiers of construction projects. The interviewees were sampled based on the prominence of their organization as well as their experience in the construction industry. The purpose was to obtain an in-depth understanding of how the various stakeholders in Zambia view cost escalation, schedule overruns and quality shortfalls.

2.1 Profiles of interviewees and their firms

Eleven out of the targeted fifteen professionals participated in the interviews. The four professionals who could not participate expressed willingness but could not be available due to other commitments in their work places. Out of the eleven interviewees, nine (9) had over eight years of experience in the construction sector and were in middle to top management. Four (4) of the interviewees worked for consultancy firms, four (4) for contractors and three (3) for clients. This provided an assurance of reasonable professional experience in management of construction projects. Most of the interviewees' firms had a long history of involvement in the construction industry. The firms' experience in construction ranged from nine to seventy-three years.

2.2 Prevalence of cost escalation, schedule overruns and quality shortfalls

There was a general agreement by all the interviewees that cost escalation, schedule overruns and quality shortfalls were prevalent in construction projects in Zambia. The interviewees also acknowledged that these shortcomings of the industry had adverse effects on the economy at large

as clients end up paying more than anticipated. The cost in terms of delayed occupancy or use of facilities, interest rates on borrowed funds, rework, etc have far reaching impacts on the nation's economy.

2.3 Causal factors

Questions aimed at obtaining the common casual factors that would lead to cost escalation, schedule overruns and quality shortfalls were posed. The interviewees had various responses that highlighted the casual factors.

(i) *Cost escalation*

The interviewees highlighted a number of factors that would cause cost escalation. The factors were compared and analyzed to assess which ones would be said to be common as appraised by various interviewees. The factors highlighted included: delayed award of construction contracts; delayed payment of Interim Payment Certificates (IPCs) to contractors; escalation and instability of prices for goods and materials due to market forces such as demand and supply; construction schedule overruns; poor planning and project management; underestimation of the budget; and corruption. Figure 2 presents the ranking of the causal factors based on the number of interviewees that identified them as common instigators of cost escalation.

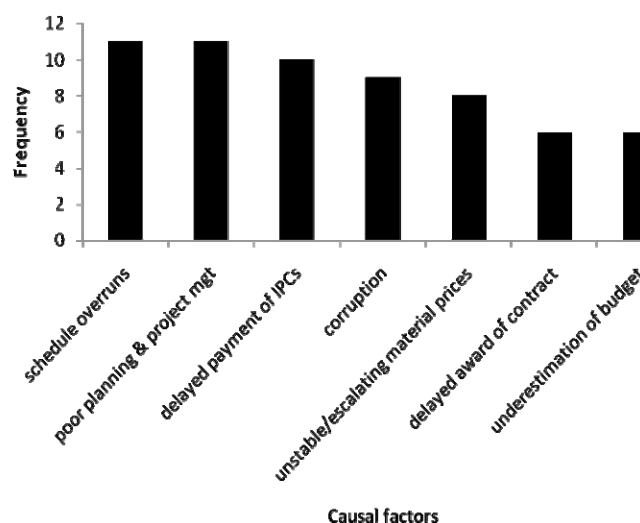


Figure 2: Ranking of factors that cause cost escalation

(ii) *Schedule overruns*

Just like cost escalation, interviewees highlighted: lack of proper project management by contractors, consultants and clients; poor organization of project resources such as plant, human, financial and material resources; inadequate or improper planning of projects; shortages of some key

materials such as bitumen and cement due to volatile market forces; inclement weather; late or nonpayment of IPCs; unstable power supply; lack of adequate supervision; requirement for materials of high specifications; and socio-economic setups of projects as the most prominent factors that they attributed to schedule overruns. The factors were ranked based on the number of interviewees that mentioned them. This information is presented in Figure 3.

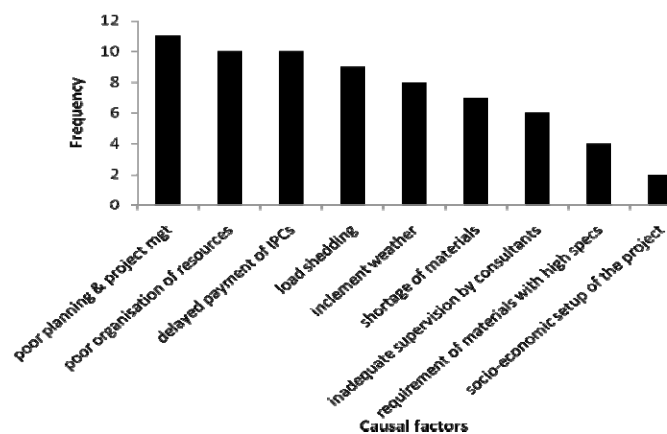


Figure 3: Ranking of schedule overruns causal factors

(iii) Quality shortfalls

The main common causes of quality shortfalls in construction projects were identified to include: corruption; lack of qualified personnel on site; lack of motivation amongst site personnel; lack of reliable sources of materials; poor quality control; and lack of adequate supervision. Figure 4 shows the ranking of these causes based on the frequency of interviewees who mentioned them as critical casual factors for quality shortfalls construction projects.

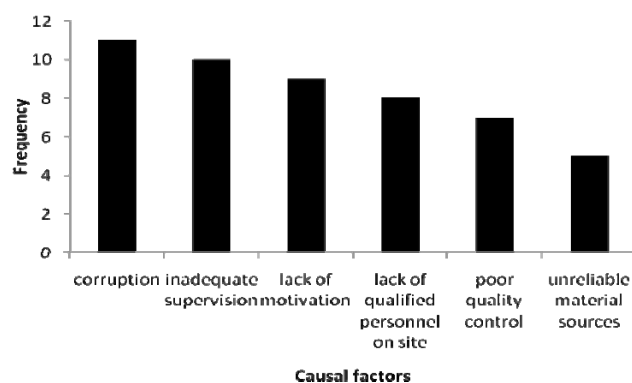


Figure 4: Ranking of causal factors for quality shortfalls

2.4 Availability of strategies and policies

Questions on the availability of strategies or policies on cost escalation, schedule overruns and quality shortfalls in particular and construction management in general indicated the knowledge gap available in Zambia's construction industry. All the interviewees indicated that there were no documented policies or strategies that could be used to address cost escalation, schedule overrun and/or quality shortfalls in Zambia. The personnel working in the industry are said to be using the rule of thumb in addressing these issues. This view was, however, not correct as there is wide literature, including academic and professional papers as well as books that have been published since the early 1960s on the subject (Schexnayder *et al*, 2003). The training programmes that deal with construction management are also on offer at various learning institutions. The knowledge gap in the construction industry would be as a result of not regarding construction management as an important field of study especially in Zambia. However, the same knowledge gap amongst the key professionals greatly exacerbates the occurrence of cost escalation, schedule overruns and quality shortfalls in construction projects.

2.5 Contractual methods that can best address cost escalation, schedule overruns and quality shortfalls

The interviewees indicated that there is generally no specific contractual method that can be said to be the best for addressing cost escalation, schedule overruns and/or quality shortfalls. Most of the contractual methods available would be useful in addressing these problems provided

competent personnel are assigned with the responsibility of managing construction projects. Careful and systematic consultant and contractor selection methods can enhance the performance of construction projects. The selection procedures for contractors and consultants are often highly subjective and inconsistent (Al-Besha, 1998). Also in most cases, selection would be based on the price which may not guarantee performance. There is need therefore to have in-depth analysis of how best the existing contractual methods can be enhanced so as to have right consultants and contractors on construction projects.

2.6 Contractual provisions and their adequacy

While most of the interviewees agreed that the contracts in use had adequate clauses and needed competent project managers to run the projects, others argued that there was need to modify contracts to match the modern technological advancements and events. The interviewees that argued on the need to modify the contracts were not familiar with the New Engineering Contract (NEC) developed by the Institution of Civil Engineers (ICE). The NEC takes into account the modern technological advancement and could be used as some forms of contracts for construction projects (McInnis, 2001). The argument should have been on there user friendliness as they are relatively new and most of the parties would not be very familiar with the clauses provided.

Regardless of which contractual provisions that would be in the contract documents, it was noted that many problems occur in construction projects because the parties do not stick to the contracts they sign. The clauses provided would only work effectively if the human resource component of construction projects is straightened out. As long as there are knowledge gaps, these problems would still continue to be major hindrances to progress on construction projects.

2.7 Party most responsible for cost escalation, schedule overrun and quality shortfalls

There was a general agreement that all parties were responsible for the prevalence of cost escalation, schedule overruns and quality shortfalls. Consultants generally felt that contractors were the first responsible party. Clients on the other hand blamed consultants for not ensuring that projects are executed within budgets, scheduled duration and prescribed quality, and as such termed them as the first responsible party. Contractors however, attributed cost escalations, schedule overruns and quality shortfalls to factors that are within control of consultants and clients.

The triangulation of the blame indicated how adversarial relations would build up especially when cost escalation schedule overruns and quality shortfalls are left unchecked on projects. The sustainability of

construction projects requires systematic measures that easily identify the party responsible for these problems. Only then would there be sustainability in implementation of construction projects.

3. CONCLUSIONS AND RECOMMENDATIONS

Cost escalation, schedule overruns and quality shortfalls in construction projects are almost always present potential obstacles to project success. The study reported in this paper indicated that there are a number of causal factors which need to be adequately dealt with if cost escalation, schedule overruns and quality shortfalls are to be minimised. The knowledge gap exhibited by some interviewees indicated the need of intensified training in the areas of construction and project management. As long as the knowledge gap remains, not much progress can be made in combating cost escalation, schedule overruns and quality shortfalls in construction projects.

To ensure sustainable construction, the following measures would be necessary:

- construction projects should always and only be managed by personnel with adequate knowledge of construction and project management;
- parties need to adhere to contractual agreements and scope i.e. there should be no unnecessary changes of scope and that projects should be frozen as much as possible once a contract has been signed;
- clients should engage consultants and contractors who have the requisite technical and financial capacity;
- since corruption was found to be the most common cause of quality shortfalls, the fight against corruption should be vigorously carried out in the construction sector in order to improve the performance of the industry;
- a stable national economy would improve the stability and performance of the industry; and
- projects need to be carefully and proficiently planned in terms of time, cost and quality.

If well implemented, these measures could significantly contribute to minimizing cost escalation, schedule overruns and quality shortfalls in construction projects.

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BUILT ENVIRONMENT RESEARCH IN SADC IN A SUFFOCATING STATUS? THE DILEMA OF IMPLEMENTING RESEARCH FINDINGS

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ABSTRACT

Purpose of this paper

The preliminary research is aimed at reflecting on piles and piles of research findings on the Southern Africa Development Community (SADC) countries built environment (SADCCBE) challenges which are gathering dust at various academic and research institutions. The paper shows that most of the challenges solutions are already found in various documents, while most of the same challenges which necessitated these research projects are tearing apart the greater SADC construction industry. The primary objective of the paper is to initiate a debate on the need to re-examine the scattered pieces of research findings on the SADCCBE) and convert them to applied form ready for use by practitioners and policy-makers.

Design/methodology/approach

The primary approach in gathering information is through a variety of methods and techniques, but primarily reviewing work across the world on implementing research finding; reviewing previous published research results on challenges facing the SADCCBE and semi-structured interviews to senior built environment researchers and policy implementers in South Africa, Botswana, Zambia and Tanzania.

Research limitations

The research was limited to four out of fifteen SADC countries due to time constraints.

Findings

Findings strongly suggest that researchers and academics within these countries continue to manage research projects through academic based systems and grant based research and presenting their findings at various forums, but very little translate to implementation.

Value

The research results will be useful by academics, researchers and policy implementers to take stock and address issues of non implementation of research findings.

Keywords: SADC, research results implementation, built environment.

1. INTRODUCTION

According to NEPAD, the poverty and backwardness of the African continent stand in stark contrast to the prosperity of the industrialised countries (UNCTAD, 2001). The continued marginalisation of Africa from the globalisation process and the social exclusion of the vast majority of its peoples constitute a serious threat to global stability. At the heart of the Africa dilemma, argues Todaro (2000), is an inexorable economic decline, a drop in per capita incomes, rapid increases in population, the loss of export revenues, the curtailment of foreign investment, the destruction of fragile ecosystems, and the inability of many countries even to feed their people and meet other basic human needs. The International Institute for Environment and Development (IIED) and the World Resources Institute (WRI) (1987) expressed the situation within Sub-Saharan Africa as the greatest challenge to world development:

"Sub-Saharan Africa poses the greatest challenge to world development efforts to the end of the century and beyond. ...Africa is the only major region where per capita income, food production, and industrial production have declined over an extended period: the only developing region where development appears in reverse...Conventional development efforts by donors and governments have largely failed to halt the spiral, indeed in some cases have aggravated it."

The NEPAD preliminary document calls for the reversal of this abnormal situation by changing the relationship that underpins it (UNCTAD, 2001). The document advances an argument that Africans are appealing neither for the further entrenchment of dependency through aid, nor for marginal concessions. The NEPAD objectives are relevant to all African industries, including construction industries.

The reversal of this abnormal situation needs a number of initiatives across all industries in Africa. One of the reversal initiatives is to address various challenges which are affecting African industries negatively. There is enough evidence to suggest that various experts and researchers across

the continent across all industries have proposed a number of solutions to these challenges, but their proposals seem to be gathering dust in their offices without any significant initiative to implement these proposals.

This paper focuses on SADC and specifically on one of these industries: the broader construction industry and critically looks at '*research results implementation*' issues.

This paper reflects on piles and piles of research findings on the Southern Africa Development Community (SADC) countries built environment challenges which are gathering dust at various academic and research institutions, while most of the same challenges which necessitated these research projects are tearing apart the greater SADC construction industry. The paper takes a closer look at the various research themes on challenges facing the SADC built environment and solutions proposed towards a good practice SADC built environment. Furthermore, the paper reports on the results of semi-structured interviews from senior built environment researchers and policy implementers in South Africa, Botswana, Zambia and Tanzania, on what has been implemented from published research results.

Finally the paper makes recommendations on '*the research results implementation challenge*' which researchers, practitioners and policy implementers, need to address in order to modernise the Southern African Development Community Construction Industries (SADCCIs) and provide a base for the NEPAD infrastructure initiatives, and consequently contribute to the greater development of the African continent.

2. IMPLEMENTING RESEARCH RESULTS – THEORY & PRACTICE

The gap between research findings and practice within the SADC built environment has been, and continues to be, a concern for those knowledgeable about the region and those who believe that construction development should be the deliberate and managed process to optimize the contribution of the construction industry in meeting SADC countries construction demand. Construction demand is tied closely with regional social economic development objectives, industry wide performance and competitiveness, and improved value to clients and society.

Taking a close look around the world and across industries and sectors, the situation is not pleasing when you look for good practice approaches on '*research results implementation*' to benchmark on. There are very few trappings of success stories in almost every industry, but the health industry across the world, seem to have realized the negative effect of the gap between research findings and practice with a different attitude. A significant number of research projects and workshops have been taking place and there are positive signs of formulating appropriate initiatives towards closing the gap (see for example Haines and Donald 1998; Haynes and Haines 1998; and Garner, Meremikwu, Volmink, Xu and Smith

2004). Literature from the health industry is used extensively in this document to address the underlying issues of theory and practice

Reflecting on various developments from the health industry research (for example: Lipman and Jones 1999; Pless 1982; and Garner, Kale, Dickson, Dans and Salinas 1998; and Bero, Grilli, Grimshaw, Harvey, Oxman and Thomson 1998) provides appropriate lenses to reflect on developments in the greater SADC construction industry. There are strong indications to suggest that getting the results of research into the right hands so that it can be used to improve the construction industry is not an easy task. Language, seem to be one of the stumbling block across industries and more so in any construction industry. The technical language of various research specialists is in most situations not the same as the general public. Furthermore, academics love to share findings, but they are not trained to deal with the public. Plus, there's little incentive in the tenure system for academics to share their findings (Lipman and Jones 1999; Pless 1982). Motivation is on producing research results and not in disseminating it?

2.1 Implementing Research Findings: who is responsible?

Reflecting on the health industry Pless (1982), argues that for many practitioners research has an air of mystery, generated, often unnecessarily, by strange terminology and an overdose of statistical symbols and notations. This observation is true for the construction industry and without doubt across most of the other industries. This is why many practitioners within construction companies and other construction experts for example, find it difficult to interpret the conclusions and to decide whether, when and how the findings should be applied. Much the same uncertainty and confusion surrounds studies of construction industry development policies: the conclusions are not always easily understood, and the practical implications are frequently unclear. Therefore, many potentially useful findings are never applied for the benefit of stakeholders or the general public.

It is assumed that interested practitioners take the trouble to seek out, read and digest, as best they can, the findings reported in journals and conference proceedings. Most investigators, argues Pless (1982), however realize that they should not rely upon reader's eagerness to learn or the passive diffusion of knowledge of knowledge to ensure that their results are acted upon rapidly or appropriately. He further contends that: *'...not all results should be put into practice quickly, since, in many instances, the passage of time helps sort the wheat from the chaff.'* However, Pless (1982) strongly suggest that researchers still must learn how to increase the efficiency with which their results are implemented – *results that have usually been produced with considerable expense, time and energy.*

Clearly, not all researchers have equal cause for concern. Many conduct their research (Lipman and Jones 1999; Pless 1982) at a very basic level of enquiry, and their results are usually of interest only to other researchers. They can safely assume that any published findings of

genuine merit will become part of the general store of knowledge. However, much of the research, contends Pless (1982), is in most situations intended to modify current practices. Whenever the results of such research are sufficiently conclusive there should be some measurable response after their publication. There are strong indications to suggest that the processes of dissemination and adoption of new findings are slow and generally inefficient.

3. IMPLEMENTING RESEARCH RESULTS – THE EVIDENCE

3.1 Interviews Logistics

Twenty (20) semi-structured interviews were conducted among randomly selected senior built environment researchers and policy implementers in South Africa, Botswana, Zambia and Tanzania as indicated in Table 70.1.

Table 70.1 Categories and number interviewed

Country	Category & number interviewed
Botswana	▪ Academics & Researchers (2) ▪ Researchers (1) ▪ Policy implementers (1)
South Africa	▪ Academics & Researchers (1) ▪ Researchers (1) ▪ Policy implementers (2)
Tanzania	▪ Academics & Researchers (2) ▪ Researchers (1) ▪ Policy implementers (1)
Zambia	▪ Academics & Researchers (2) ▪ Researchers (1) ▪ Policy implementers (1)

As clearly indicated in Table 70.1, 2 academic/researchers, 1 researcher and 1 senior person working in the public sector responsible for built environment policy implementation were interviewed in Botswana.

In South Africa, 1 academic/researcher, 1 researcher and 2 senior persons working in the public sector institutions responsible for construction industry policy implementation were interviewed.

Two academic/researchers, 1 researcher and 1 senior person working in the public sector institution responsible for construction industry policy were interviewed in Tanzania.

The distribution of Zambian interviewees was the same as Tanzania, where, 2 academic/researchers, 1 researcher and 1 senior person working in the public sector institution responsible for construction industry policy were interviewed

Due to lack of space and brevity, the research findings covered in the interviews were taken from randomly selected papers and reports written by expert researchers from the four SADC countries. The recommendation themes summary of these documents was formulated as indicated in Table 70.2.

After identification of recommendation themes (A and A1; B&B1; C&C1; D&D1; and E,E1 &E2), an informal verification process was carried out by communicating with the interviewees (Table 70.1) in order to establish if the recommendation themes were relevant to the respective country - these are identified with a letter 'R'. Furthermore, the interviewees were requested to indicate if they were familiar with the research report/paper on respective recommendation themes - these are identified with a letter 'K'. The themes which were not relevant and those in which they were not familiar with letters 'Ro' and 'Ko' were used respectively.

Table 70.2 Research recommendation themes per country

Research recommendations themes and authors					
	Msita (1998); & DPW (1999); Rwelamila & Lobelo (2000); Lema (2000)	Lema & Price (1998); Mlinga & Lema (2000)	Rwelamila, Talukhaba and Ngowi (1999); Kamala & Hindle (2000); Rwelamila, Talukhaba & Kivaa (2000)	Rwelamila (1996)	Walls & Wells (2000); Carradine & Logie (2000); Ssegawa (2000)
	(A):Uncoordinated construction professionals (A1): Insolencies among construction firms	(B):Poor constructed work & low productivity (B1): Developing informal contractors	(C):Bad practice procurement approaches (C1): Majority of CPM are accidental	(D):Poor project management	(E): Improving construction materials supply (E1): SMME development (E2):Poor SMME financial management
	R&K	R&K	R&K	R&K	R&K
Botswana					
South Africa	R&K	R&K	R&K	R&K	R&K

Tanzania	R&K	R&K	R&K	R&K	R&K
Zambia	R&K	R&K	R&K	R&K	R&K

Relevant (R) & Familiar (K); Not relevant (Ro) & Not familiar (Ko)

3.1 Interview Results – Synthesis and Analysis

In order to establish the levels of implementing research findings, recommendation themes identified in Table 70.2 were put before the respondents (see Table 70.1) to indicate if implementation had taken place and the extent of implementation. The following measurements were used to measure *'implementation of research results recommendations'*: a percentage from 0P (points) = no implementation and no plan evidence towards implementation to 100P (points) = full implementation has taken place. Each research result recommendation was treated independent of the other and marked on 100points basis. With a total of 10 research results recommendations, a total 10,000 points is the maximum each country can get if full implementation of recommendations has taken place. The interview results with total measurement on implementation research results recommendation are shown in Table 70.3.

Table 70.3 Interview results – implementation scores

Country	Recommendation Themes & Implementation Scores					
	A & A1 T=200P	B & B1 T=200P	C&C1 T=200P	D T=100P	E, E1 & E2 T=300P	Total %
Botswana	30P & 05P	50P & 05P	20P & 05P	40P	50P, 50P & 20P	2.8%
South Africa	60P & 20P	60P & 30P	50P & 40P	50P	70P, 50P & 20P	4.5%
Tanzania	60P & 10P	40P & 05P	50P & 05P	35P	45P, 45P & 10P	3.1%
Zambia	60P & 10P	40P & 05P	30P & 05P	35P	45P, 40P & 10P	2.8%

The interview results confirm issues discussed under Section 2 above, that there is a significant gap between knowledge production and consumption. The percentage score on implementation of research results for all four countries falls below 5%. The overall average is 3.3%, which suggest that 96.7% of research results produced remain un implemented in the four countries surveyed. In order to get a clear picture of the situation and

appreciate the underlying issues behind these dismal scores, each country's results are assessed separately.

3.1.1 Botswana

The Botswana research recommendations scores are the lowest (same as Zambia) when compared with the four countries surveyed. Taking a closer look at theme A (coordination of construction professionals, score of 30P), you will find that construction experts are not well coordinated because some of them are not statutorily regulated like in Tanzania, South Africa and Zambia. This situation creates challenges for the development of these experts. Continuing professional development (CPD) initiatives couldn't be enforced because of the lack of a statutory vehicle. Insolvencies among construction firms (theme A1, score of 5P) are rampant because contractor development programmes are very thin on the ground and contractor development good practices are not put into practice. The general quality of constructed work, especially and work done by the majority of citizen contractors leaves a lot to be desired. This sorry state is clearly confirmed by theme B scores which not more than 50P. The main contributors to the 50p score are the big South African contractors, some Chinese contractors based in Botswana, and a small number of excellent citizen contractors. There is no formal development programme in Botswana for informal contractors, but a trapping of some initiatives which are primarily intended for formal citizen contractors (theme B1, a score of 5P). Project procurement approaches in Botswana are still dictated by the traditional procurement approach. This has led to a situation where alternative procurement systems are embraced with traditional procurement tools which have created contradictions and consequently very little appreciation of the strengths of alternative systems (hence theme C, with a score of 20P). The procurement system environment has directly affected the slow emergence of construction project management (CPM) as a distinct profession in Botswana. The majority of CPMs are still accidental project managers – enthusiastic civil engineers, architects, construction managers and quantity surveyors with very little CPM knowledge base (theme C1, with a dismal score of 5P). The fact the majority of CPMs are accidental as confirmed under theme C1 score, processes of managing projects are consequently very poor (theme D, with a score of 40P). The quality and efficiency of construction materials logistics in Botswana could be described as average (theme E, with a score of 50P). Emphasis on preferences and development of SMME (citizen contractors) has put the plight of SMME to the fore, but the push seems to come more from the government and very little from the contractors themselves (theme E1, with a score of 50%). Financial management ethos of SMMEs still fall behind what could be described as good practices (theme E2, with a score of 20P).

From the foregoing it could be argued that research findings implementation is still a Cinderella of the Botswana construction industry. A focused project is the only option to move out of this sorry state.

3.1.2 South Africa

The South African research findings implementation scores are the highest of the four countries surveyed. Probably this was expected when you compare economic development levels between the countries. A closer look at theme A (coordination of construction professionals, score of 60P). This is a very high score and a reflection on the status of organisation of construction experts. All construction professionals in South Africa have a statutory requirement to register, and this has brought a formal framework of regulating professionals for good practice. The principal aim of regulating the professions is to protect the public. It is important state that South Africa is the only country within SADC with a statutory registration requirement for construction project managers and construction managers as distinct professionals. Although insolvencies among construction firms (theme A1, score of 20P) are to some extent very common but South Africa situation is slightly better than other three countries surveyed. Strict financial systems and corporate governance systems advances have contributed significantly to the situation. When compared with all countries within SADC, the general quality of constructed work could be described as good. This promising is clearly confirmed by theme B score of 60P. There is no formal development programme in South Africa of informal contractors, but like Botswana, the informal contractors seem to enjoy the trappings of some initiatives which are primarily intended for formal emerging contractors (theme B1, a score of 30P). But, it should be said that the state of informal contractors support is still below the required levels. Project procurement approaches in South Africa, like in Botswana, are still dictated by the traditional procurement approach, though not at same levels. The South African situation looks better than the rest on SADC, though still a long way to reach required levels (hence theme C, with a score of 50P). Although the majority of CPMs practicing in South Africa are predominantly accidental like in Botswana, the emergence of the statutory registration body: the South African Council for Project and Construction Management Professions (SACPCMP) has brought in an element of standards and a future possibility of enhancing CPM knowledge as one of the requirements (thus theme C1, with a score of 40P). The fact that the majority of CPMs are accidental, though with a bit of control from the SACPCMP puts South Africa in a better position than other SADC countries, hence a better score of 50P for theme D. The quality and efficiency of construction materials logistics in South Africa are excellent, and there are opportunities for other SADC countries to learn from a well structured system with significant characteristics of good practices. A score of 70P for theme E is testimony to a well structured system. Emphasis on preferences and development of SMME, like in Botswana (specifically emerging contractors) has put the plight of SMME to the fore in South Africa, but like Botswana the push seems to come more from the government and very little from the contractors themselves, in terms of putting more effort to improve management of their businesses (theme E1, with a score of 50%). Financial management ethos of SMMEs like in

Botswana still fall behind what could be described as good practices (hence theme E2, with a score of 20P).

The gap between research findings and implementation is still very huge. A deficit of approximately 95.5% is alarming for a country like South Africa which boasting of about 5 world class construction companies and a well established construction expert base.

3.1.3 Tanzania

The Tanzanian research recommendations scores are the second highest, when you compare with the other three countries surveyed. Taking a closer look at theme A (coordination of construction professionals, score of 60P), you will find that construction experts are well coordinated because the traditional construction professions: architects, engineers; and quantity surveyors are statutorily regulated like in South Africa and Zambia. The only professions which are currently not regulated by law are construction project management and construction management. This is where South Africa has got an edge over Tanzania. The fact that registration of the 3 traditional professions has been in existence for a long time puts Tanzania in a balanced situation, hence a score of 60P for theme A. Insolvencies among construction firms (theme A1, score of 10P) are common but better than Botswana, hence a better score of 10P. But, it is important to say that insolvencies among construction companies are still a huge problem, which needs to be dealt with. The general quality of constructed work, especially work done by the majority of citizen contractors leaves a lot to be desired. This sorry state is clearly confirmed by theme B score, which is below 50P (a score of 40P has been given). Like in Botswana, there is no formal development programme in Tanzania for informal contractors, but since a programme exist for formal contractors, the informal contractors seem to benefit from some trappings, which are primarily intended for formal contractors (theme B1, a score of 5P). Project procurement approaches in Tanzania, like in Botswana, are still dictated by the traditional procurement approach. This has led to a situation where alternative procurement systems are embraced with traditional procurement tools, though there are initiatives to address the situation (hence theme C, with a score of 50P). The procurement system environment has directly affected the slow emergence of construction project management (CPM) as a distinct profession in Tanzania, like in most SADC countries with the exception of South Africa. Like in most SADC countries, the majority of CPMs are still accidental project managers – again enthusiastic civil engineers, architects, construction managers and quantity surveyors with very little CPM knowledge base (theme C1, with a dismal score of 5P). As in Botswana, the fact the majority of CPMs are accidental as confirmed under theme C1 score, processes of managing projects are consequently very poor (theme D, with a score of 35P). The quality and efficiency of construction materials logistics in Tanzania is still archaic and need a well organised strategy (theme E, with a score of 45P). Emphasis on preferences and development of local contractors has brought a slight change on the plight of citizen

contractors, but still a lots need to be done (theme E1, with a score of 45P). Financial management ethos of SMMEs still fall behind what could be described as good practices and worse than in Botswana and South Africa (theme E2, with a score of 10P).

The Tanzanian built environment, and specifically the construction industry still faces an enormous challenge of bridging the gap from a 3.1% positive research implementation position to a deficit which is standing at 96.9%. Like in Botswana, a focused project is the only option to move out of this limping position.

3.1.4 Zambia

Zambia total research recommendations, implementation scores are at the bottom of the pile – a tie with Botswana (at 2.8%). Taking a closer look at theme A (coordination of construction professionals, score of 60P), you will find that construction experts are well coordinated because the traditional construction professions: architects, engineers; and quantity surveyors are statutorily regulated like in Tanzania and South Africa. The only professions which are currently not regulated by law are construction project management and construction management. This is where South Africa has got an edge over Zambia. The fact that registration of the 3 traditional professions has been in existence for a long time, like in Tanzania, puts Zambia in a balanced situation, and thus a good position for theme A. Insolvencies among construction firms (theme A1, score of 10P) are common but better than Botswana. But, like in Tanzania, it is important to say that insolvencies among construction companies are still at an alarming rate, hence the need to address the challenge. The general quality of constructed work, especially work done by the majority of citizen contractors leaves a lot to be desired like in Tanzania. This sorry state is clearly confirmed by theme B score, which is below 50P (a score of 40P has been given). Like in Botswana, Tanzania and South Africa, there is no formal development programme in Zambia for informal contractors, but since a there initiatives for formal contractors, the informal contractors seem to benefit from some trappings, which are primarily intended for formal contractors (theme B1, a score of 5P). Project procurement approaches in Zambia, like in Tanzania and Botswana, are still dictated by the traditional procurement approach. This has led to a situation where alternative procurement systems are embraced with traditional procurement tools, (hence theme C, with a score of 30P). The procurement system environment has directly affected the slow emergence of construction project management (CPM) in Zambia as a distinct profession. The majority of CPMs are still accidental project managers – again enthusiastic civil engineers, architects, construction managers and quantity surveyors with very little CPM knowledge base (theme C1, with a dismal score of 5P). As in Tanzania and Botswana, the fact the majority of CPMs are accidental as confirmed under theme C1 score, processes of managing projects are consequently very poor (theme D, with a score of 35P). The

quality and efficiency of construction materials logistics in Zambia, like in Tanzania to some extent is still archaic and need a well organised strategy (theme E, with a score of 45P). SMME development still has some ad-hoc characteristics and there is still so much which needs to be done to address the current situation (theme E1, with a score of 40P). Financial management ethos of SMMEs in Zambia, still fall behind what could be described as good practices and worse than in Botswana and South Africa (theme E2, with a score of 10P).

Like other three countries, the Zambian built environment, and specifically the construction industry still needs a paradigm shift in order to address the gap from a 2.8% positive research implementation position to a deficit which is standing at 97.2%. Like in Botswana and Tanzania, a well structured project is the only option to move out of this dismal position.

3.1.5 Interview results summary

The interview of results from randomly selected senior built environment researchers and policy implementers in South Africa, Botswana, Zambia and Tanzania, have confirmed the author's belief that there is a gap between research findings and practice in the SADC built environment. Research implementation gaps shown in Table 70.3 should be a concern to all SADC built environment stakeholders – especially public policy implementers, constructors and other construction experts.

Although South Africa seem to have a better research implementation score of 4.5%, when compared with the other three countries (3.1% for Tanzania; 2.8% for both Botswana and Zambia), this score is not proportional to her economic development levels and resources ability to address challenges facing her construction industry. The corresponding enormous gap of 95.5%, need to stimulate debate among the academics, researchers and policy makers and implementers - especially the Construction Industry Development Board (CIDB).

The Tanzanian research implementation score is second to South Africa (3.1%), but again very small if you look at the challenging state of the Tanzanian construction industry. The corresponding gap of 96.9% is the clarion call to institutions like the National Construction Council (NCC) and other sister organisations to take note and reflect on their priorities for construction industry development.

Botswana's research score is the lowest (2.8%), and the limping state of the Botswana construction industry confirms this. The Botswana built environment academics, research community and policy implementers need to reflect on this dismal score and think about solutions. Solutions should aim at using the abundant research results and how these should inform the strategy towards addressing current and future construction industry challenges. The need to address the 97.2% gap should be a challenge to all Botswana built environment stakeholders.

The Zambian implementation score, which is the same as Botswana (2.8%), leaves a lot to be desired and a challenge to all built environment stakeholders. The 97.2% gap need combined efforts from the academics,

researchers, and policy makers and implementers to work as team and utilize the solutions which are 'buried' in various research documents.

If these results could be interpolated, for the whole SADC built environment, the message to all stakeholders is that despite the considerable resources which are spent on research, relatively little attention is being paid to ensuring that research findings are implemented in practice. There is a need to find appropriate interventions that can be used to promote behavioural change among construction industry practitioners and the implementation of research findings. ASOCSA could become a convener for these interventions.

4. CONCLUSIONS & RECOMMENDATIONS

The results of this preliminary study and theory and practice issues reported above strongly suggest that a large gap exist between built environment knowledge generated through research and its application in individual, industry stakeholders, expert organisational, and policy innovation.

An average deficit of approximately 96.7% for the four countries surveyed is alarming – *it is a huge challenge*. Hence the question which should be asked by SADC built environment stakeholders is: *How can the built environment community solve this challenge?* First, the research community must acknowledge that the problem exists. Various studies in the medical industry have identified a number of barriers which are relevant to the construction industry, these include: *inadequate interaction between researchers and practitioners, lack of knowledge of advances in various spheres of project management and construction management, and resistance to change*. One can't fault these perceptions. At the heart of the problem are deficiencies in the construction researchers' knowledge of how to inform and to alter behaviour of both practitioners and clients.

All the best efforts of basic researchers and those in construction management and construction project management research are of little use to the clients, users of built environment products and other construction experts if the results are not conveyed to those who can use them in an efficient manner. Busy construction industry practitioners can hardly be expected to peruse through journals, conference proceedings and other research reports or to interpret the results correctly when the reports are laced with statistics. It is the responsibility of the researcher to convey the information in a more palatable form and the follow up any construction industry development findings to determine if they have reached their targets and whether the intended changes in behaviour have occurred. If they have not the researcher must find the reasons for the failure and begin looking for some means of rectifying it.

This is a challenging new task for most academics, researchers policy practitioners (like CIDB, NCI, etc) and may require combined talents from several construction expert areas. None the less, it is an essential undertaking and one that must be approached with dedication and

imagination if research resources are not to be wasted in the lean years ahead. Probably the initiative should start with ASOCSA.

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AVOIDING DIFFERENCES AND DISPUTES: A CONSTRUCTION MANAGEMENT PERSPECTIVE

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ABSTRACT

Purpose

This paper serves to identify problems related to project communication which may cause differences and disputes in respect of construction projects in the property development sector.

Design

Three studies were conducted. Study 1 was undertaken with 10 construction professionals who worked on a large shopping centre development project, which suffered communication and dispute problems. Previously a questionnaire was sent to imminent professionals, and interviews were conducted with prominent construction managers and contractors. In total, 22 questionnaires were completed and returned and interviews conducted (Study 2). Study 3 was a follow-up to Study 2 where 20 questionnaires were sent to prominent construction professionals who work more actively in development and construction. These three studies enabled the researchers to establish methods and procedures that may assist project teams to resolve disputes in an amicable manner. Various dispute resolution methods were analysed and critically reviewed to establish the preference, effectiveness of, and problems related to each.

Findings

Results identified the methods that may influence effective dispute resolution between clients and contractors. The Studies also showed elements of good dispute resolution strategies. Structured communication management and continuing interaction are basic elements to avoid disputes.

Value

The results of this study may assist contractors by enabling them to identify the most appropriate forms of dispute resolution to be agreed upon in cases where differences and disputes arise and where the settlement of these disputes has to be anticipated.

Key words: Cost management, construction communication, disputes, claims, construction industry.

1. INTRODUCTION

Project communication is an important part in the development and maintenance of relationships that ultimately influence and control the project. During the project development phase of the project studied, many professionals felt inhibited by the almost autocratic communication style of the project manager which influenced the natural participation of agents.

2. TYPES OF COMMUNICATION IMPORTANT FOR PROJECT COMMUNICATION

2.1 Verbal communication

Scott (1984:12) outlined the following in terms of verbal communication: "The brain is a remarkable tool. It has the capacity to remember, to be creative, to analyse and to articulate; but, all too often, when people are trying to put their thoughts in order, they find it very difficult. They find that despite knowing their subject matter very well, they cannot easily sort it out into a simple framework".

Rodger Sperry, a Nobel-prize winner for his work, "Two sides of our mind", had a real effect on peoples' comprehension of inter-personal communication. His work strengthens the premise that effective communication represents total comprehension that is aimed at the total person (Decker, 1989:36).

Credibility, sincerity and integrity is the key to effective communication and should be clear, observable, visual, verbal and vocally absorbed by the listener, as stated by Bernard Baruch "The ability to express an idea is well nigh as important as the idea itself." (in Decker, 1989: 27-35).

Architects and construction managers find face-to-face communication to be the most effective type of communication media (Emmitt & Gorse, 2003:119).

The shopping centre case study however, concentrated less on this aspect and more on the written communication instruments but, verbal communication disruptions were caused by ineffective written

communication instruments and procedures. The above principles were largely ignored by the parties (client, project manager and principal agent) involved, which lead to a breakdown in natural flowing communication that could have resulted in improved solutions to serious problems.

2.2 Written communication

The other important attribute of man is the ability to write. The communicator must make sure that their written meaning and aims are understandable to the reader (Berry, Kotze & Du Toit, 2008).

According to Emmitt & Gorse (2003:124), written reports, letters, minutes of meetings, etc. are essential for the smooth running of projects and will be used as evidence in the event of a dispute. Compared with oral communication, all written communication should be more concise, more discreet, more accurate and free of ambiguity to the reader.

In commerce the main aim is to ensure that the receiver understands precisely what is written, because time is money in business. The fewest possible words that are clearly presented is the aim in written communication (König, Conradie, Geyer, Van der Westhuizen, Albertyn, De Bruyn, Valkhoff, Van Schalkwyk, 1993:105).

According to Sillars (1994:161), every letter communicates two messages, namely information for the receiver and an indication of the sender. The outlay clarity, accuracy of expression and inclusion of all the relevant detail is important to help the reader formulate an impression of the writer. In business this could have a large impact, especially if the letter content is selling goods or services. The above principles were not always adhered to by the parties involved in the project (Study 1), which added to communication difficulties. Part of the written communication documentation was contractual communication which is a vital element of the quantity surveying communication.

2.3 Contractual communication

Written communication principles are also relevant in contractual communication principles. Malherbe and Lipshitz (1978:72) stipulate the following principles that are fundamental when drawing up a contract:

“The parties must be at one as to the consequences contemplated by such agreement or in other words, as to their intention in the application of agreed contractual relations”.

Loots (1985:3) argues that “the success or failure of a construction contract is greatly dependent on the managerial effort expended by the employer and his architect, project manager, consulting engineer or quantity surveyor when formulating and awarding a contract.” Figuratively speaking, one should choose your weapons before you enter a battle.

2.4 Project communication instruments used by construction professionals

The aim of Study 2, undertaken by the University of the Free State in 2006, was to test the communication instruments that professionals in the construction industry normally use. Table 1 shows the results of this research project based on a questionnaire sent to architects, quantity surveyors and engineers.

Table 1: Importance of communication instruments used by professional quantity surveyors in private practice for projects

RESPONDENTS: Groups: Average			
Communication instruments	Architects	Engineers	Quantity Surveyors
Estimations	3.58	3.76	4.82
Cost plan	0.00	3.39	4.73
Payment advice	0.00	3.38	4.46
Cost report	0.00	3.43	4.71
Escalation costing presentation	0.00	3.39	4.59
Final accounts	0.00	3.68	4.83
Standard system document	0.00	3.55	4.37
Contract conditions document	0.00	3.93	4.76
Preliminaries document	0.00	3.68	4.66
Preambles for trades document	0.00	3.82	4.51
Drawings	4.96	4.86	0.00

Source: University of the Free State, Department of Quantity Surveying and Construction Management, 2006. (Ratings are: 1= low, 3= intermediate, 5 = high)

The importance of estimations, cost plans, cost reports, escalation costing presentation, final accounts, contract conditions document, preliminaries documents and preambles for trades document, as communication instruments of the quantity surveyor, were identified as extremely positive and rated above 4.5 (90%).

The payment advice (interim payment document to contractor) and standard system document were also experienced in a positive manner as communication instruments of the quantity surveyor, but although highly rated, were considered by the respondents to be least important and rated slightly below 4.5 (90%).

Drawings as communication instruments of the architect and engineer were identified as extremely important and rated almost 5 (100%).

3. RESEARCH: THE CASE STUDY (Study 1)

The aim of this paper is to identify problems related to project communication which may cause differences and disputes in respect of large construction projects in the property development sector. The case study project (shopping centre) investigated was not unique in respect of problems related to communication, communication instruments, claims and counter claims and differences of opinion.

The original contract was concluded between the main contractor, an international company, and a client who operates throughout South Africa, for an amount of about ZAR450 million, based on the provisional bills of quantities method, of which about 50% of costs were for building and structural work and 50% for specialist installations included in the contract sum as provisional sums. A project manager was appointed after the production process commenced and communication systems were largely changed by him. Many sub- and direct contracts had to be concluded with specialists. The complexity of many contracts and changes in communication systems added to the difficulties.

The research project aimed at analysing the opinions and perceived frustrations of the quantity surveyors who, on behalf of the client, had to develop tender and contract documents, cost reports, notifications, payment valuations and general cost and cost planning communications during the design and construction process.

The ten (10) quantity surveyors who were involved in the project in various capacities were interviewed, and responded to a specific questionnaire related to the main aspects that were identified as quantity surveying elements. The aspects are: communication instruments (13 questions), the effectiveness of these instruments (8 questions), communication and claims (11 questions), and possible future solutions to improve communication and avoid claims (8 questions).

The responses to the questions enabled the research group to identify the most serious problems and suggested solutions. The solutions suggested by the respondents assisted the research group to propose possible solutions to more effective communication procedures, processes, instruments and links.

Table 2 shows the identified communication instruments used in the project, and the results of the respondent's opinions in respect of these.

Table 2: Results in respect of all identified instruments used in the case study

A.	OPINIONS ON COMMUNICATION INSTRUMENTS USED	Average Result 1-5	%
	A1 The original Bills of Quantities (Provisional bills)	2.9	58
	A2 Cost reports	4.1	82
	A3 Site / contract instructions	2.4	48
	A4 Minutes of meetings	2.7	54
	A5 E-mail communications by project manager	2.6	52
	A6 Employer's instructions	1.6	34
	A7 Packages (identification of work packages by project manager)	2.1	42
	A8 Package bills of quantities	3.2	64
	A9 Design and Specification	2.5	50
	A10 Drawings and details	2.6	52
	A11 Specialists cost / budget reports (example: Electrical engineer)	2.7	54
	A12 Claims communication	2.4	48
	A13 E-mail communication by agents	2.7	54

Source: University of the Free State, Department of Quantity Surveying and Construction Management, 2007. (Ratings: 1= low, 3= intermediate, 5 = high)

The ten respondent's opinions (100% response) on the communication instruments used on the project were tested and resulted in an average opinion of 2,6 (52%) (on a scale of 1 = poor and 5 = excellent) in respect of all the communication instruments used. However, the original provisional bills of quantities were allocated 2,9 (58%) average and the cost reports 4,1 (82%) in respect of effectiveness.

Table 3 shows the results in respect of all general communication elements. It is also clear that apart from cost reporting and package bills of quantities, all instruments and communication processes were seen as below average expectations of quality procedures.

Table 3: Results in respect of all general communication elements

B.	STATEMENTS IN RESPECT OF COMMUNICATION	Average Result 1-5	%
	B1 E-mail communication was effective	2.7	54
	B2 Drawing distribution was managed well and on time	2.3	46
	B3 The professional team had an effective relationship	2.4	48
	B4 Project manager's project communication was effective and well managed	2.2	44
	B5 Owner / professional team relationship contributed to efficient management	1.6	32
	B6 Time and programming was managed well	1.7	34
	B7 Budget was clear and met the owner's strategy	2.2	44
	B8 Professional agents empowered to do their work well	2.0	40

Source: University of the Free State, Department of Quantity Surveying and Construction Management, 2007. (Ratings: 1= low, 3= intermediate, 5 = high)

The respondents were clear on their opinions related to the effectiveness or quality of general communication in respect of the specific project (Tables 1 and 2). The communication elements that were seen as least effective and most problematic were time management and project management communication (1.7) (34%). Owner / professional team relationship contributed to inefficient management (1.6) (32%). Professional agents empowered to do their work well were rated (2.0) (40%), indicating interference with appointed duties.

The following important elements of communication were also investigated in respect of the respondent's opinions thereof. These are shown in Table 4.

Table 4: Important elements of communication investigated and respondent's opinions thereon

C.	OTHER COMMUNICATION PROBLEM CONTRIBUTORS	Average Result 1-5	%
	C3 Claims for valuation of payment certificates were clear and on time	3.0	60
	C5 A good communication atmosphere was introduced via e-mail	2.4	48
	C7 The fact that the architects, structural engineer and project managers were from other cities was not problematic	2.3	46
	C10 Scope management to budget was to standard	2.3	46
	C11 Project managers were available	2.6	52

Source: University of the Free State, Department of Quantity Surveying and Construction Management, 2007. (Ratings: 1= low, 3= intermediate, 5 = high)

Problems that clearly showed themselves were identified. The elements that stand out in respect of communication disruptions are:

- Site and contract instructions
- Employer's instructions
- Identification of work packages by project managers
- Design and specifications
- Drawings and details
- Drawing distribution was not managed well
- Professional team's relationships
- Project Managers project communication was effective
- Owner / professional team relationships did not contribute to efficiency
- Time and programme management was not done well
- Due to the owner's strategy the budget was unknown
- Professional agents were not empowered
- Communication atmosphere at meetings was not good

- The fact that the project manager, architect and structural engineer were not local professionals was problematic

E-mail communication used for this project received a very negative response regarding the quantity surveyor's opinions of 54% effectiveness. The experience here was that some e-mails were loaded with emotions. This may be due to the fact that e-mail responses are immediate or early, while the e-mail that a person is responding to is emotionally instilled.

The current situation regarding the project is that the final account cannot be settled and many claims and resolutions are outstanding. The client and contractor are heading towards arbitration and more than ZAR60 million is at stake, of which about ZAR52.5 million is for penalties for late delivery. Many claims for delays are not resolved. The above communication disruptions influenced disputes and differences negatively. A clear communication strategy was absent and this contributed further towards the unacceptable state of affairs.

4. RESEARCH: AVOIDING DIFFERENCES AND DISPUTES: THE SURVEYS (Studies 2 and 3)

The goals of claim and dispute resolution are firstly to establish the right of any party to submit a claim, and secondly to enable the other party to consider the claim in terms of its validity, contractual terms and possible outcome (Verster, 2006)

Lodging or considering a claim does not mean that a dispute exists, but should the rejection of a claim occur, or a different interpretation of a claim or opinion exist, one has to realise that a dispute may then be lodged. Dispute resolution should then assist the parties in resolving such an impasse in a cost effective, satisfactory and timeous manner (Verster, 2006)

4.1 The surveys

Study 2, conducted among 22 construction professionals, lead to the establishing of the preference rating of various dispute resolution methods. The response rate of professionals was 100% (University of the Free State, 2006). Table 5 shows the respondents preferences for various alternative dispute resolution (ADR) methods.

Study 3 was undertaken with 20 professionals who work more actively in development and construction. They were asked to respond to the same questionnaire. Eleven responded, indicating a response rate of 55%.

Table 5 Preferred ADR methods

Method:	Quantity Surveyors %	Construction Managers %
Mediation	80	0
Agent resolution	80	90
Conciliation	75	60
Adjudication	66	60
Arbitration	60	60

Source: University of the Free State, Department of Quantity Surveying and Construction Management, 2006

Table 6 indicates the success rate of the various dispute resolution methods as seen by the respondents of Study 3.

Table 6: Results in respect of claims elements

RESPONDENTS VIEWS ON SURVEY RATINGS	%
Arbitration	74
Conciliation	72
Mediation	66
Adjudication	66
Expert resolution	38

Source: University of the Free State, Department of Quantity Surveying and Construction Management, 2007. (Ratings: 1 = low, 3 = intermediate, 5 = high)

The above two tables are not exactly the same because the questionnaires for each study were independently compiled by different researchers. The comparison, however, still remains meaningful.

It is interesting to note that although the respondents of Study 2 showed preference for mediation, conciliation and adjudication, the respondents of Study 3 indicated arbitration as being the most successful. This may be due to the fact that arbitration is still mostly used and that other methods are perhaps not well known, or are less formalised and do not lead to finality.

5. SOLUTIONS TO BETTER COMMUNICATION: Study 1

After the negative experience regarding communication and claims in respect of the researched project, the involved quantity surveyors' opinions

were clear as far as solutions to the communication problems were concerned. Noteworthy quantity surveying solutions identified by the quantity surveyors involved are:

- Established communication instruments must be used
- Timeous payment of claims, valuation and certification hold a key to avoiding disputes
- Continuous pro-active structured interactions
- An agreed project communication framework
- Building a team that works together towards a common goal

Table 7, shows that amongst the solutions to improve communication and avoid claims, two dispute resolution methods received a favourable response: A claims forum (86%) and a claims resolution strategy (82%).

Table 7: Results of responses related to solutions for better communication

D	SOLUTIONS TO IMPROVE COMMUNICATION AND AVOID CLAIMS	IMPORTANCE	
		Average Result 1-5	%
	D1 An agreed project communication framework	4.2	84
	D2 An established communication forum	4.2	84
	D3 Establish communication instruments must be used	4.5	90
	D4 Budget strategy: communication to agent about financial and budget strategies	4.3	86
	D5 Timeous payment claims, valuation and certification	4.7	94
	D6 Continuous pro-active interaction	4.6	92
	D7 A claims forum, consisting of project manager, quantity surveyor, architects, contractor and employer (with power to resolve differences)	4.3	86
	D8 A claims resolution strategy to ensure that functionaries have resolution power prior to external resolution taking place	4.1	82

Source: University of the Free State, Department of Quantity Surveying and Construction Management, 2007. (The ratings are: 1= low, 3= intermediate, 5 = high)

6. CONCLUSION

The research project shows that strong communication networking and links may contribute to successful communication, the limitation of disputes and disruptions, and positive end results. The lessons learned from this case study are that communication breakdowns lead to undesirable end results in respect of this case study project. However, the solutions suggested may enhance effective communication and lead to a better understanding between all parties involved in a project.

It seems clear that a pro-active communication strategy and claims resolution process should form part of a project management approach. Even though the project was managed by a large, well-known firm of project managers, the communication situation was unacceptable. Although the project was late, over budget and of average quality, it seems to work reasonably well as an investment.

7. RECOMMENDATIONS

It is recommended that prior to the start of a project development phase, a strategic communication and claims procedure process and plan must be designed involving all stakeholders, including the client, contractor, project manager, architect, quantity surveyor, engineers and perhaps tenants. The procedure and plan should include the following:

- A pro-active communication framework sharing all the important links
- The manner in which parties send and respond to e-mails
- An established communication forum involving the most important role players
- Pre-designed and established, preferably standard, communication instruments
- Empowerment of strategic role-players i.e. the project manager, principal agent, architect and quantity surveyor
- A claims resolution strategy including various alternative resolution methods to be implemented in the agreement.
- A claims forum to resolve claims effectively, timeously and finally

Further research is however needed to understand:

- the generality of communication and claims problems,
- other solutions available and to perhaps propose a communication and claims resolution model, and
- the use of current information technology for more effective project communication to be implemented regarding large projects where so many professionals and agents are involved, and where so much may be jeopardised or lost.

“With communication in place, the team is in the race”

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THE RESUSCITATION OF DECLINING COMMUNITY SHOPPING CENTRES

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ABSTRACT

Purpose of the paper

To establish factors that lead to a decline of a shopping centre, and to propose remedial measures.

Design/methodology/approach

Three comparable shopping centres in Randburg, South Africa were selected for investigation. A total of 300 interviews (100 for each centre) were undertaken in July 2008 to establish the shopping frequency and the likes and dislikes of customers before and after refurbishment.

Findings

The main factors customers disliked in declining centres were tenant mix, range of goods, absence of security, dull malls lacking in stimulation and lack of clearly designated entrances. Major likes after refurbishment were indicated to be acceptable tenant mix, comfort, accessibility and parking and ambience.

Value

The findings can be used as guidelines in the refurbishment of shopping centres,

Research limitations

Findings are limited to community shopping centres in trade areas comparable to the centres investigated.

Practical implications

Shopping centre owners should undertake regular market research to ensure the continued viability of their assets.

Keywords: Refurbishment, shopping centres, Randburg

1. INTRODUCTION

Shopping centres have become a part of urban living and are an essential component of property investment portfolios. Continued refurbishment of shopping centres is necessary to ensure the continued viability of shopping centres (Beyard & Omara, 2005).

The study investigated factors that lead to the decline of community shopping centres in an urban setting. Three comparable centres were investigated, namely Randridge Mall, Heathway Square and Northcliff Corner. In the former two cases surveys were undertaken before and after major refurbishments, while in the latter case customer dislikes were surveyed to give an indication of factors that may lead to declining patronage.

The centres investigated range between 16 500m² and 21 000m² – a category that is classified as 'community' centres' (SACSC 2008). These centres were selected because they comparable in size, age, trade area and location. The three centres are in the broader Randburg area that contains a total of five community centres. Of the remaining two centres, one (The Piazza Centre) is on the fringe of Randburg while the other one (Lifestyle Garden Centre) is strictly speaking a lifestyle centre and therefore not comparable to the selected centres. Northcliff Corner has a GLA of 16 666m², Heathway Square 20 966m² (including some small office component), and Randridge Mall 18 957m². Northcliff Corner is viewed as the 'greyfields' centre, where retail business has declined to below a healthy level, with a trading density is below R290 per square metre (IPD 2008).

Randridge Mall underwent a revamp exercise that was completed in 2004/2005. Heathway Centre was redeveloped in 2007. Northcliff Corner has not undergone a refurbishment exercise since 1997.

2. METHODOLOGY

Standard questionnaires were used to collect information on shopping frequencies, customer likes and dislikes, preferred neighbourhood shopping centres, and reasons for the support of the identified shopping centres before and after the refurbishment (in the case of Northcliff Corner questions were confined to likes and dislikes of the existing centre as no refurbishment has taken place yet at the time of interviews).

The interviews were conducted from 10:00 to 17:00 on three consecutive days (9–11 July 2008).

A total of 100 customers at each of the centres was interviewed as they were entering or leaving the shopping centre. According to Prinsloo (2002) a sample size of 100–200 is adequate for centres up to 20 000m². The collected data analysed statistically using one-way ANOVA (Analysis of Variance). ANOVA facilitates the analysis of multidimensional data sets in exploratory analysis of data distribution and correlation. It is a particularly effective tool for analysing highly structured data.

The levels of statistical significance were:

*** = $P \leq 0.001$

** = $P \leq 0.01$

* = $P \leq 0.05$

3. FINDINGS

3. 1. Randridge Mall (RR)

3. 1.1 Shopping frequency

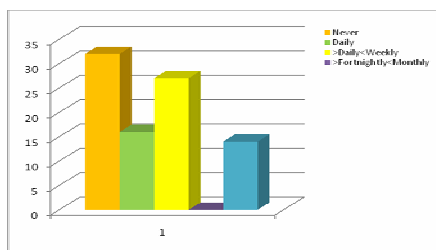


Figure 1 Pre-refurbishment

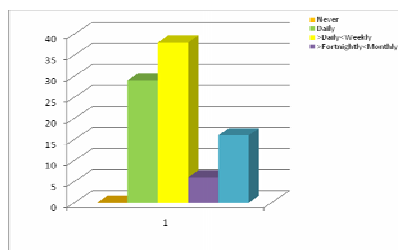


Figure 2 Post-refurbishment

The figures show that after refurbishment;

- 'Daily' shoppers improved from 16 to 29.
- 'Daily-Weekly' shoppers improved from 27 to 38.
- 'Weekly-Fortnightly' shoppers improved from 1 to 11.
- 'Monthly shoppers improved from 14 to 24.
- 'Never' responses were completely removed.

3.1.2 Pre-refurbishment preferences

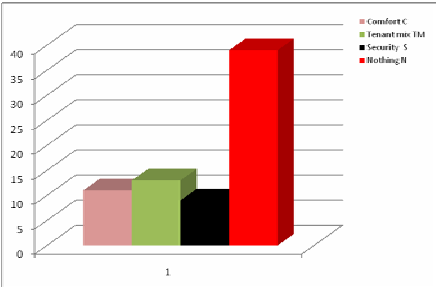


Figure 3 Pre-refurbishment likes

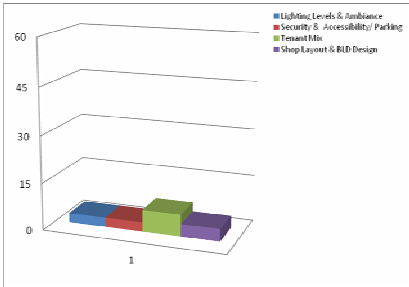


Figure 4 Pre-refurbishment dislikes

3.1.3 Post-refurbishment preferences

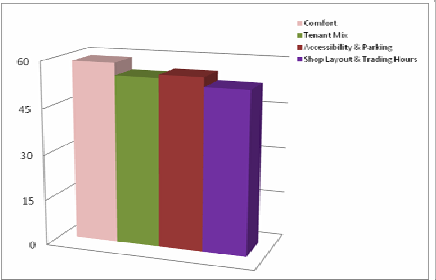


Figure 5: Post refurbishment likes

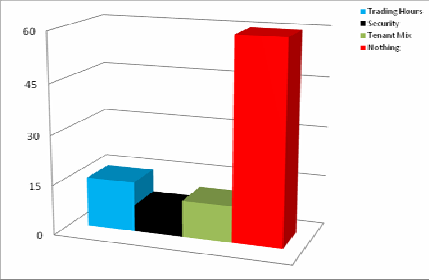


Figure 6: Post refurbishment dislikes

3.1.4 Competition

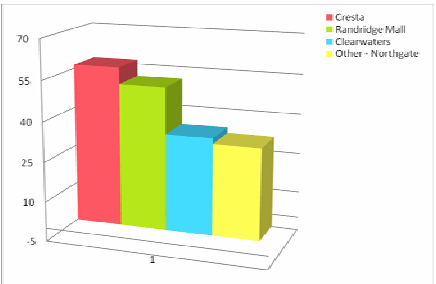


Figure 7 Preferred shopping centres

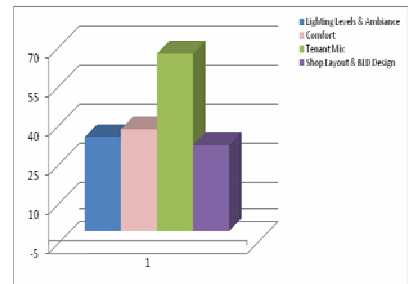


Figure 8 Reasons for choosing identified shopping centres

3.2. Heathway Square (HW)

3.2.1 Shopping frequency

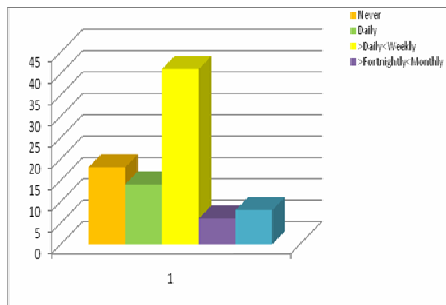


Figure 9 Pre-revamp

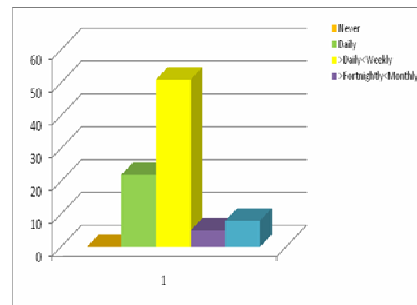


Figure 10 post revamp

The figures show that after refurbishment;

- 'Daily' shoppers improved from 14 to 22
- 'Daily-Weekly' shoppers improved from 41 to 51
- 'Monthly' and 'by-monthly shoppers' remain unchanged.
- 'Never' respondents were completely removed after refurbishment.

3.2.2 Pre-refurbishment preferences

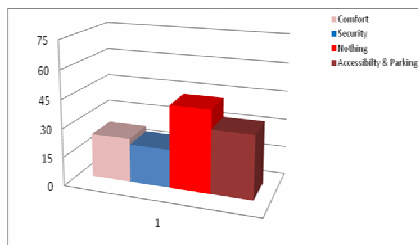


Figure 11 Pre-revamp likes

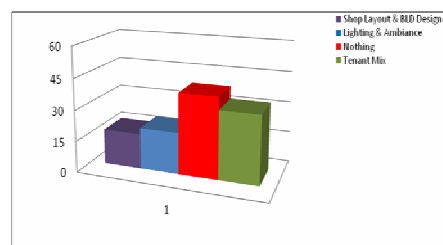


Figure 12 Pre-revamp dislikes

3.2.3 Post-refurbishment preferences

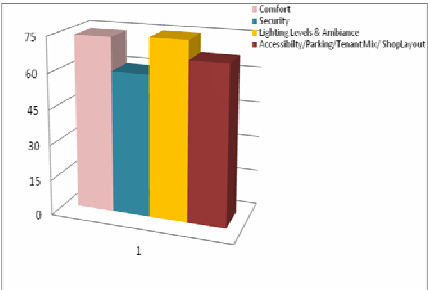


Figure 13 Post-revamp likes

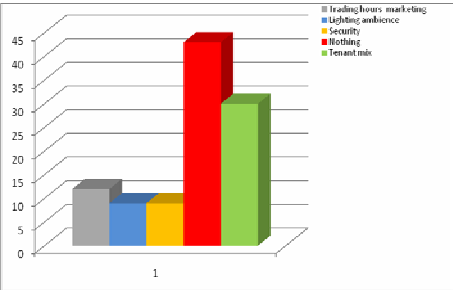


Figure 14 Post-revamp dislikes

3.2.4 Competition

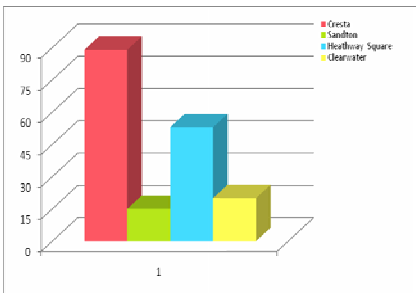


Figure 15 Preferred centres

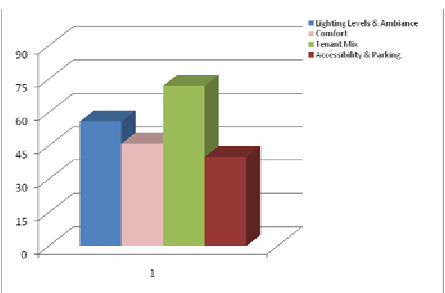


Figure 16 Reasons for choosing centres

3.3 Northcliff Corner (NC)

3.3.1 Shopping frequency

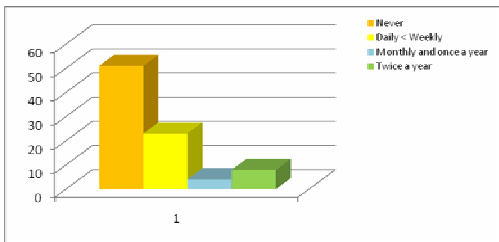


Figure 17 Shopping frequency at Northcliff Corner

3.3.2 Pre-refurbishment preferences

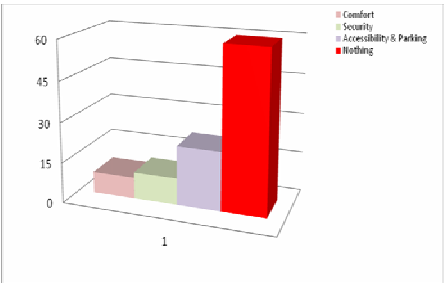


Figure 18 Customer likes

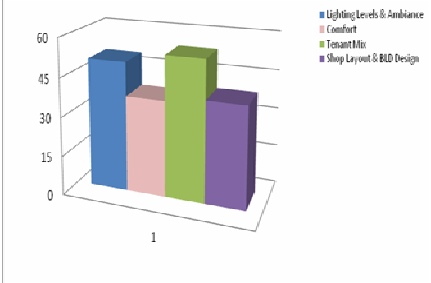


Figure 19 Customer dislikes

3.3.3 Post-refurbishment preferences

There are no post-refurbishment preferences (likes/dislikes) at Northcliff Corner since no refurbishment work has been undertaken, at the date of the survey for over a period of at least 10 years.

3.3.4 Competitors

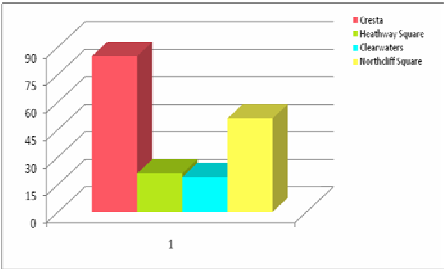


Figure 20 Preferred centres

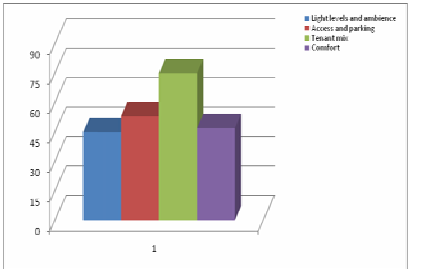


Figure 21 Reasons for choosing centres

3.4 Quantitative data analysis using one-way analysis of variance

Tables 1 (a, b, c) summarize the shopping frequency in the three selected malls during pre-and post-revamp by residents with different lengths of stay in the area. Values are means $\pm$ standard error, and means followed by dissimilar letters in a column are significantly different at $*P \leq 0.05$; $**P \leq 0.01$; $***P \leq 0.001$. (* = significant; ** = very significant; *** = highly significant).

Table 1 (a) Shopping frequency before revamp

Frequency	Pre-revamp (length of stay)		
Daily	0-5 yr	5-10 yr	> 10 yr
>daily<weekly	4.0 $\pm$ 2.0c	1.7 $\pm$ 0.9abc	5.0 $\pm$ 3.6b
>Fortnightly<monthly	8.3 $\pm$ 1.3b	4.3 $\pm$ 1.5a	17.7 $\pm$ 5.2a
Monthly	1.3 $\pm$ 0.9c	0.7 $\pm$ 0.3bc	1.3 $\pm$ 0.9b
Bi-monthly	2.0 $\pm$ 0.6c	1.3 $\pm$ 0.9abc	5.0 $\pm$ 1.5b
Quarterly	1.5 $\pm$ 1.5c	0.0 $\pm$ 0.0c	0.0 $\pm$ 0.0c
Twice a yr	1.3 $\pm$ 0.3c	0.3 $\pm$ 0.3bc	0.0 $\pm$ 0.0c
Once a yr	2.0 $\pm$ 0.6c	0.3 $\pm$ 0.3bc	1.3 $\pm$ 1.3b
Never	1.0 $\pm$ 0.6c	0.3 $\pm$ 0.3bc	2.0 $\pm$ 1.2b
<i>F. Statistics</i>	16.3 $\pm$ 2.0a	3.7 $\pm$ 2.2ab	10.0 $\pm$ 7.1ab
Daily	17.4***	2.3*	2.9**

Table 1 (b) Shopping frequency after revamp

Frequency	Post-revamp (length of stay)		
Daily	0-5 yr	5-10 yr	> 10 yr
>daily<weekly	13.0 $\pm$ 3.0a	4.5 $\pm$ 1.5a	8.0 $\pm$ 5.0b
>Fortnightly<monthly	14.5 $\pm$ 1.5a	4.0 $\pm$ 2.0a	26.0 $\pm$ 7.0a
Monthly	1.0 $\pm$ 0.2b	2.0 $\pm$ 0.01ab	3.0 $\pm$ 0.02b
Bi-monthly	4.5 $\pm$ 1.5b	1.0 $\pm$ 0.0b	5.5 $\pm$ 1.5b
Quarterly	0.5 $\pm$ 0.5b	0.0 $\pm$ 0.0c	1.5 $\pm$ 1.5b
Twice a yr	1.5 $\pm$ 0.5b	0.0 $\pm$ 0.0c	0.0 $\pm$ 0.0c
Once a yr	1.0 $\pm$ 1.0b	0.0 $\pm$ 0.0c	0.5 $\pm$ 0.5b
Never	2.5 $\pm$ 0.5b	0.0 $\pm$ 0.0c	1.0 $\pm$ 1.0b

<i>F. Statistics</i>	0.0±0.0c	0.0±0.0c	0.0±0.0c
Daily	14.2***	3.9**	6.5**

Table 1 (c) Improvement in shopping frequency after revamp

Improvement in visiting frequency	
Daily	12.5±4.5a
>daily<weekly	17.0±0.0a
>Fortnightly<monthly	4.0±0.03b
Monthly	4.0±3.0b
Bi-monthly	0.5±0.5b
Quarterly	1.5±0.5b
Twice a yr	0.5±0.5b
Once a yr	2.5±1.5b
Never	0.0±0.0c
<i>F. Statistics daily</i>	8.0***

Key findings:

- At pre-refurbishment stage, the respondents who “**never**” visited the three Malls were statistically higher in number for the 0-5, 5-10, and >10 yrs groups of residents in the area..
- At post re-furbishment stage, the respondents who visited the Malls “**daily**” and “**more than daily to weekly**” showed significantly higher numbers.
- After re-furbishment, all the residents interviewed had visited the Malls (the “Never” group was zero), thus showing a highly significant increase the number of **daily to weekly** shoppers.

Table 2 (a) and (b) indicate the number of customers in the study who liked certain aspects of the shopping centres, at pre- and post-revamp. Values are means ± standard error, and means followed by dissimilar letters in a column are significantly different at *P ≤ 0.05; **P ≤ 0.01; ***P ≤ 0.001. (* = significant; ** = very significant; *** = highly significant).

Table 2 (a) Pre-revamp customer likes

Frequency	Length of stay in the study area		
	0-5 yr	5-10 yr	> 10 yr
Lighting & ambiance	1.7±1.2a	1.0±0.6a	5.3±3.0b
Comfort	3.0±1.7a	2.0±1.0a	8.3±3.4b
Security	3.0±1.7a	2.0±1.0a	8.0±2.5b
Management	2.3±2.3a	0.7±0.7a	3.3±2.8b
Tenant mix	4.0±1.0a	0.3±0.3a	7.0±3.2b
Accessibility & parking	6.5±0.5a	3.0±1.0a	18.0±6.0a
Shop layout & building design	3.7±2.0a	1.0±0.6a	6.3±1.3b
Affordability	1.7±1.2a	1.3±0.3a	5.3±2.4b
Trading hours	2.0±1.0a	0.3±0.3a	4.0±2.5b
Marketing	1.0±1.0a	0.0±0.0c	2.0±1.2b
Convenience	0.3±0.3a	0.3±0.3a	0.7±0.3c
Exclusivity	0.0±0.0a	0.0±0.0a	0.0±0.0a
<i>F. Statistics</i>	1.13 ^{ns}	1.9 ^{ns}	2.4**

Table 2(b) Post revamp customer likes

Frequency	(length of stay in the study area)		
	0-5 yr	5-10 yr	> 10 yr
Lighting & ambiance	24.0±11.0abc	5.0±1.0abcd	29.5±7.5a
Comfort	26.0±4.0ab	9.0±2.0a	30.0±2.0a
Security	21.0±2.0abcd	7.5±1.5ab	23.0±3.0ab
Management	8.5±6.5bcd	3.0±2.0bcd	12.5±6.5bcde
Tenant mix	28.0±2.0a	5.5±0.5abc	27.5±3.5ab
Accessibility & parking	25.0±3.0ab	7.5±1.5ab	29.0±4.0a
Shop layout & building design	24.0±7.0abc	7.0±1.0ab	29.0±1.0a
Affordability	19.5±0.5abcd	6.0±3.0ab	16.5±6.5bcde
Trading hours	5.0±1.0cd	2.5±0.5bcd	6.0±1.0cde
Marketing	11.5±0.5bcd	6.0±2.0ab	20.5±7.5abc

Convenience	4.0±4.0d	0.0±0.0c	0.0±0.0c
Exclusivity	10.5±10.5bcd	0.5±0.5cd	2.5±1.5de
<i>F. Statistics</i>	2.5*	3.5**	6.2***

Key findings:

- At pre-revamp stage, no aspect of the Malls was significantly liked by the people who lived in the area for 0-5 and 5-10 yr. However, respondents who lived there for more than 10 yr (>10 yr) showed significantly greater likeness for the Malls because of accessibility and parking.
- At post re-vamp, there was a significant increase in customer likes of the Malls by residents at each level of stay (i.e. 0-5, 5-10, and >10 yr) in the area, but more so for 0-5 and >10 yr of stay. After re-vamp, tenant mix was most liked by customers, followed by comfort, accessibility and parking, lighting and ambience, as well as shop layout and building design.

Table 3 summarizes the total number of people interviewed in all three centres who showed preference for certain regular shopping centres in the area. Values are means $\pm$ standard error, and means followed by dissimilar letters in a column are significantly different at * $P \leq 0.05$; ** $P \leq 0.01$; *** $P \leq 0.001$. (* = significant; ** = very significant; *** = highly significant).

Table 3 Preferred centres

Preferred Centre	(length of stay in the study area)		
	0-5 yr	5-10 yr	> 10 yr
Cresta shopping centre	30.7±5.49a	10.3±2.40a	36.7±3.93a
Sandton city	8.0±3.51b	1.3±0.88ab	4.3±0.88abc
Fourways mall	4.7±1.45b	2.3±1.45ab	1.0±0.58c
Heathway square	9.3±6.36b	2.3±0.67ab	15.3±6.74b
Randridge mall	8.0±7.02b	3.7±2.33ab	12.0±5.57abc
Clearwaters	10.0±1.15b	3.3±1.86ab	10.0±3.61abc
Northcliff square	6.3±2.85b	2.7±2.19ab	14.0±9.17ab
Other-Southgate	1.0±1.00c	0.0±0.0d	0.5±0.50c
Rosebank	3.7±2.03bc	0.0±0.0d	2.0±1.00bc
Other-Northgate	4.7±1.76b	4.7±2.19ab	8.0±4.73abc
Other-Randburg mall	0.3±0.33c	0.3±0.33c	0.0±0.0d
Other-Eastgate	0.0±0.0d	0.0±0.0d	0.3±0.33d
Other Westgate	3.0±0.58bc	0.0±0.0d	2.0±1.00bc
Other-Athol	1.0±0.00c	0.0±0.0d	0.0±0.0d
Other-Maponya	0.3±0.33c	0.0±0.0d	1.3±0.67c

Other-Rosebank	0.3±0.33c	0.0±0.0d	0.0±0.0d
<i>F. Statistics</i>	5.9***	4.3***	6.8***

Key findings:

- Cresta Shopping Centre attracted significantly more customers than any other Mall.
- For the 0-5 yr residents, Cresta Shopping Centre had significantly more shoppers, followed by Clearwater Mall, Heathway Square, Randridge Mall, Fourways, and Sandton.
- For the 5-10 yr residents, Cresta Centre had statistically more shoppers, followed by Northgate and Randridge.
- For > 10 yr residents, Cresta Centre again attracted more customers than all the other malls, followed by Heathway and Northcliff Square.

Table 4 tabulates the number of customers per stated reason for choice of regular shopping venues. Values are means ± standard error, and means followed by dissimilar letters in a column are significantly different at *P ≤ 0.05; **P ≤ 0.01; ***P ≤ 0.001. (* = significant; ** = very significant; *** = highly significant).

Table 4 Reasons for choosing identified centres (length of stay in the study area)			
	0-5 yr	5-10 yr	> 10 yr
Lighting level & ambiance	19.7±3.7ab	7.0±1.7ab	19.0±3.5b
Comfort	20.3±1.5ab	6.0±1.5abc	19.3±3.5b
Security	12.0±3.5bcde	4.3±1.2bcd	12.0±4.2bcd
Exclusivity	8.3±3.8cde	2.3±1.9bcd	5.7±1.8cd
Management	3.3±2.4e	1.3±0.9cd	4.0±1.5d
Tenant mix	27.7±4.8a	10.7±3.3a	34.7±3.2a
Accessibility & parking	16.3±1.8bc	4.0±0.6bcd	19.3±3.5b
Layout/design	13.3±1.9bcd	6.0±2.1abc	14.3±3.4bc
Affordability	7.0±1.7cde	1.3±0.3cd	8.0±2.0cd
Trading hours	10.3±0.3cde	3.3±1.9bcd	9.3±2.7cd
Entertainment	4.0±3.1de	0.3±0.3d	3.0±2.5d
Marketing	6.3±2.0de	0.3±0.3d	5.0±2.1cd
Convenience	8.7±3.2cde	1.3±0.3cd	9.0±2.0cd

Key findings:

- “Tenant mix” was significantly the major factor for shoppers’ preference of alternative shopping centres across all residential groupings.
- For the 0-5 yr residents, “tenant mix” was the most significant reason for shoppers’ preference of alternative regular shopping malls, followed by comfort, lighting level and ambiance, and accessibility and parking.
- For 5-10 yr residents, tenant mix was also the main factor for customers’ choice of alternative regular shopping centres, followed by lighting level and ambiance, and comfort.
- For >10 yr residents, tenant mix was again the most important factor determining customers choice of alternative shopping centres, followed by comfort, lighting level and ambiance.

4. VALUE

The post revamp customer-likes reveal that ‘*Tenant Mix*’ is paramount in retaining and attracting new customers to a centre. When customers reflected their preference for Cresta shopping centre, they confirmed that their support for this centre was based on the availability of the right ‘Tenant Mix’ in this centre. While factors that include “*Accessibility and Parking*, ‘*Comfort*’ and ‘*Ambience*’ also enhance the popularity of a shopping centre, Schwanke (1994:91) observes that “*in the end shoppers are attracted to a shopping centre for its stores, and the success of the center will be determined by the quality and mix of tenants.*”

Bearing in mind the above, it is clear that ‘*market research*’, the ‘*timing of a refurbishment*’ project and the ‘*re-marketing*’ of a shopping centre after a revamp are invaluable considerations in the successful redevelopment of a declining shopping centre.

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QUANTIFYING ALL PRIMARY INDUSTRY - INDUSTRY RELIANCES FOR DEVELOPMENT AFTER CONFLICT

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ABSTRACT

Purpose of this paper

Many countries across the African continent have property and construction sectors that have been destroyed through the ravages of political and military conflict. This paper reports on an original investigation into the quantitative role ("Reliance") that each primary industry has on every other primary industry in South Africa. This leads to the argument that it is often necessary to "reconnect" an entire economy if particular sectors are to rebound.

Method

The paper provides an primary industry-industry matrix for Reliances in an existing economy, and argues that a similar matrix has to be painstakingly built up for a reconstructed economy. A matrix of primary industry-industry interdependencies ("Reliances") in a national economy was obtained from official sources for South Africa. This secondary data, from official sources is used and cleaned up in this work to illustrate a formal, economy, allowing the reader to form a mental picture of the myriad of Reliances. In the illustrative example, the contribution of *each* primary industry to *every* other primary industry was quantified to show the mutual dependencies.

Findings

With all industries being interdependent, all Reliances in a collapsed economy must be converted from informal trading to formal trading. Mutual dependencies and their relative sizes are of importance.

Practical implications

The Reliance matrix can be used, for example, to plan the processes needed for the subsequent recovery of a war-torn country.

Value of paper

The paper shows the scale of all interdependencies in a formal economy. The paper is of value particularly for bodies providing international aid to any country, to evaluate priorities in rebuilding an economy.

Keywords: Formal economy, rebuilding a collapsed economy, Industry-Industry Reliances, historical figures.

1. INTRODUCTION

If a country that has been war-torn needs to be reconstituted, then economic and social reliances are of critical importance for its development. This work is primarily focussed on the connections in the formal 'economy' that need to be re-constituted. It chooses to ignore the informal relationships that existed during the years of conflict except to give the opinion that they will surely be become formalised during the post-conflict economy. For precision, the concept of the economy is operationalized as all contributions that make up the Gross Domestic Product (GDP), and is here aggregated at the Primary industry level. The Primary industry – Primary industry contributions can then be placed in a matrix of Inter- and Intra- sectorial Gross Industrial Product (GIP). In the post-conflict era, certain sectors, or for that matter, the whole economy may have become disfunctional and need to be reconstituted. Since logically each sector in the economy relies on input which is the output from all other sectors, an impasse arises and this impasse needs to be broken. This work investigated a way of breaking the impasse through converting the economy from a partial or fully informal economy to a formal economy in which different sectors are appropriately linked. In this study, the construction sector is highlighted as a keystone, specimen sector. That is, it is supported by and supports other sectors of the economy. Further, an argument can be made outside the matrix that the reconstruction of the construction sector may have a profound impact on the demand for land and on the performance of the property market as a whole.

1.1 Definitions

Economy is operationalized here as the Gross Domestic Product of the nation concerned.

Inter-sectorial activity is defined here as one component of the economy, and is here operationalized as the payment from one primary sector to a different for goods and services provided.

Intra-sectorial activity is defined here as the economic activity within a primary sector of the economy. It is here operationalized as the payment

from one primary sector to the same sector for goods and services provided within that sector.

Reliance is mutual interdependence, operationalised as the Inter- and Intra- sectorial Gross Industrial Product, and denoted by the use of the symbol Rij, which is the forwarded money ("purchaser's prices"), measured e.g., in Rands for inter- or intra- sectorial economic activity. (Reliance could have been called a Relationship, but this word does not imply direction. Official documents and economists use the noun "Use", pronounced "Uce", but this printed word is ambiguous as to whether it is a noun or verb)

Growth ratio is the ratio of the value of reliance at a future time divided by the current reliance.

2. REVIEW OF LITERATURE

Although an otherwise interesting contribution, MacDonald's paper Economic Reform and Private Sector Development Section Sector Project 'Innovative Tools for Private Sector Development' (2006) pays little attention to the importance of innovation in the post conflict reconstruction stage, yet he does point out the need to develop new political institutions and presumably new institutions to finance the reconstruction of the social and economic infrastructure.

"(g)iven the demands on governments, it is all too easy to try and do a little of everything, thereby achieving nothing." says Addison (2001).

The current research is built on a contrary foundation that it is important to succeed in doing a little of everything for the country to succeed – this research also emphasizes that the dimensions of the interventions are of importance. The key aspect of this paper therefore is the important observation that initial policy interventions, as small as they may be, are of importance in bringing a post-conflict economy to its feet.

3. THE RECONSTRUCTION AND DEVELOPMENT TASKS

The often small tasks facing a new government attempting to reconstruct and develop the country are manifold and include:

- Rebuilding the economy;
- Reconstructing the infrastructure;
- Reconstructing the financial and fiscal systems;
- Educating, training new entrants to the market and re-skilling old entrants;
- Reconstructing other sectors.

To this should be added the importance of reconnecting an economy into a single functioning entity. The outcome of the years of conflict also means

that historic arrangements are often altered to reflect the ambitions of the victors. Evidence from a number of post-conflict countries suggests some level of “institutional lock-in” may exist. This often results in post conflict arrangements carrying on into the future.

4. CREATING ECONOMIC OPPORTUNITY

Generally, for post-conflict reconstruction, success is clearly premised on three conditions: (1) establishing security; (2) restoring good governance, which includes the rule of law; and (3) creating economic opportunity (Forman, 2002). The current paper concentrates on the 3rd aspect, and draws attention to the importance of jump-starting the economy through advancing all primary economic sectors, because of their mutual inter-dependences. People are still the basic asset for helping the recovering country as they are needed to provide innovative ways to foster this economic development. The introduction of new technologies may be helpful, allowing a country to leapfrog over unwanted interim technologies. With the shift in the available occupations, new employment skills and re-skilling is possible, which in turn permits the post-conflict economy to rebuild itself.

5. GROSS INDUSTRIAL PRODUCT

From a statistics gathering perspective, the economy of the country, as operationalised in the GDP, is analysed according to Standard Industrial Classification (SIC). The first digit of the SIC is the primary industrial sector (or industry). In South Africa, industries are classified according to the Standard Industrial Classification of all Economic Activities (SIC). SIC is based on the International Standard Industrial Classification of all Economic Activities (ISIC, 1990), with suitable adaptations for South African conditions. (StatsSA, 2008)

Table 1 gives the full official (StatsSA, 2008) designation of each sector, and this paper’s abbreviated names. The contribution, in 2007, of each major sector to the economy appears in the last column. This is the Gross Industrial Product, the value added to the economy by the particular industry, derived from StatsSA (2008). In other words, the table is used to add up the individual contributions of each industry to the economy viz., nearly 5 million million Rand.

Table 1. Abbreviations for sectors, as used in this paper

Official designation (StatsSA, 2008)	This paper	GIP in MR p.a. (StatsSA, 2008)
Agriculture, forestry, fishing	Farm	148 417
Mining and quarrying	Mine	332 456
Manufacturing	Make	2 198 994
Electricity, gas and water	Supply	86 980
Construction	Build	237 371
Trade, hotels, restaurants	Trade	120 927
Transport, communication	Move	364 217
Finance, business services	Bank	761 633
Other services	Service	723 626
Gross Domestic Product 2007		4 974 621

To make Table 1 easier to interpret it has been ordered not according to SIC, but according to GIP. This has been done for this work in Table 2. In Table 2, the economy has been divided up and sorted according to the magnitude of the contributing industry. Thus, it can now be readily seen that South Africa is predominately a manufacturing economy.

Table 2 Sectors, sorted according to contribution to GDP

Official designation (StatsSA, 2008)	Sector	GIP in MR p.a. (StatsSA, 2008)
Gross Domestic Product 2007		4 974 621
Manufacturing	Make	2 198 994
Finance, business services	Bank	761 633
Other services	Service	723 626
Transport, communication	Move	364 217
Mining and quarrying	Mine	332 456
<i>Construction</i>	<i>Build</i>	<i>237 371</i>
Agriculture, forestry, fishing	Farm	148 417
Trade, hotels, restaurants	Trade	120 927
Electricity, gas and water	Supply	86 980

Table 2 illustrates how each primary industry contributed to the South African economy (GDP) in 2007 at 2007 prices. The table shows these contributions, also referred to as Gross Industrial Product (GIP). For example, the Construction Industry (labelled 'Build') contributed R237 371 000 000 to the GDP, which then stood at R4 974 621 000 000. This means that the Construction Industry appeared to be the 6th largest primary industry out of the 9, comprising only 5% of the economy. The authors challenge and correct these conclusions in a later section.

The percentages may differ from country to country, as each country has its own portfolio and pattern of industries. For example, S. Africa is dominated by relatively large manufacturing, and service industries. See Table 2.

The linkages that exist between sectors are often manifold. The construction sector relies on the performance of the property sector and for instance the availability of land and financing. Further relationships exist with the sectors that provide building materials and labour markets.

6. EVERY INDUSTRY COUNTS (ON EVERY OTHER INDUSTRY)

Consider now a closed economy, such as in a single country, where an industry with rank j provides goods or services to another industry with rank i . In return, (as this is a just, working society), industry i provides payment to industry j , as indicated in figure 1, generated for this paper.

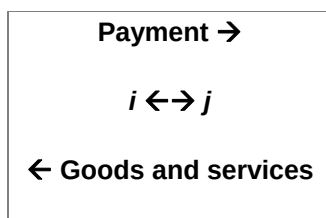


Figure 1. Payment rendered for goods and services provided between industries of a country

The United Nations Development Group (2003) gives an example, which this paper will generalize. The Group points out: "Investment in housing development contributes to national economic development. The sector contributes to the Gross Domestic Product (GDP) through induced output in other sectors with which the sector has backward and forward linkages."

In general, every sector or industry of the economy, i , provides outputs to all the other industries, j , of the economy and in turn, each industry requires inputs from every other industry.

This paper operationalizes the strength of the trade between i and j as its contribution to the GDP, here named *Reliance*, which is the Inter- and Intra- sectorial Gross Industrial Product excluding exports, and is denoted by the symbol R_{ij} , being the forwarded monetary value (“purchaser’s prices”), measured e.g., in units of Rands for these transactions. The variable R_{ij} is the Gross contribution to the economy from industry i for the industry j , being for all goods and services provided in the *reverse* direction from j to i . Thus R_{ij} represents the Reliance of industry j on industry i ’s goods and services. Each R_{ij} is a contribution to the Gross Domestic Product (GDP) of the country. Because the study area is a closed economy, the $GDP = \sum R_{ij}$. For example, R_{23} constitutes the Gross payments from the industry 2 to the industry 3 for goods or services provided by the industry 3 to the industry 2.

Besides for external transactions, where $i \neq j$, there are also transactions *internal* to each industry, R_{ii} . For example, R_{11} is the sum of all transactions within the industry 1. This is illustrated by Table 3, a matrix of Reliances for the South African situation in 2007. The base information is from the official source (StatsSA 2008), but has been re-ordered by row and by column from the largest GIP to the smallest GIP. This made it easier to spot anomalies. In general, the figures in columns should decrease from left to right, and figures in rows should decrease from top to bottom. Data has been missing for the Build-Make cell from 2005-2007. Also there was a distortion in the official table purporting that mining exceeds building row-wise, but not column-wise. This distortion was in fact caused by the missing Building-Making cell, which is estimated by the authors for 2007 as being 88 767 Million Rand (the geometric mean of the figure immediately higher than it and the figure immediately lower than it). The consequential corrected sums are shown in bold font in Table 3.

Table 3 now reveals that, in reality, the Construction Industry is the 5th largest primary industry out of the 9, passing the Mining industry which is the 6th largest primary industry. Construction is then really 7% of the South African economy. This paper will not address the next question which arises, viz., which is the larger industry: moving or services.

Please note that this Table is based on the price that the industry pays for the goods or services (“purchaser’s prices”), before adding roughly the same value (and thereby roughly doubling the value of the goods or services upon selling). Therefore the total of Table 3 is roughly half of the GDP presented in Tables 1 and 2. That is to say, the average industry business model can thus be seen from the data in the current paper to be “buy some things; add value to them; sell them at roughly twice the price paid”.

In Table 3, the Reliances of the construction industry have been italicised. For example, goods and services were supplied by the

construction sector to the financial services sector with a value of 9 164 million Rand. In the reverse direction, the banking sector provided goods and services to the construction sector with a value of 21 378 million Rand. Internally, the construction sector provided goods and services to itself to the value of 51 949 million Rand.

Table 3. The SA Reliance matrix, giving Inter- and Intra- sectorial Gross Industrial Product in Thousand MegaRand p.a. (2007)

	Make	Bank	Service	Move	Build	Mine	Farm	Trade	Supply	
TOTAL	936	305	270	193	166	0.1	64	217	43	2 400
Make	581	49	120	82	80	0.04	43	52	9	1 056
Bank	77	190	62	38	21	0.008	3	91	4	498
Service	38	11	45	5	2	0.01	2	2	0.02	125
Move	32	32	24	47	3	0.04	7	46	1	239
Build	88	9	5	1	51	0.002	0.05	5	4	170
Mine	124	0.2	1	0.5	5	0.001	0.05	0.04	8	142
Farm	63	0.07	1	0.006	0.01	0.00005	4	1	0.03	70
Trade	2	9	6	11	0.4	0.0008	0.4	12	0.2	44
Supply	16	3	3	4	0.5	5	1	4	14	53

In general, the authors of this paper have detected that the 2007 figures were estimated by StatsSA officials from the 2006 figures merely by increasing each column by a constant *growth ratio* between 1.06 and 1.11, depending on the industry growth ratio column. The 2006 figures were not estimated by officials from the 2005 figures, so, the 2006 figures must have been from a census, not an extrapolation. Thus, actual growth ratios cannot be derived from the 2005-2007 data. Also, the authors of the current paper recommend that a bi-proportional model for StatsSA estimating would have been better.

7. GROWTH OF THE ECONOMY

Subject only to the assumption of statistical independence of industries, which is not exactly true,

$$P(ij) = P(i) P(j) \quad (1)$$

By definition of probability of a transaction, this is expanded to

$$R_{ij}/S = O_i/S * T_j/S \text{ or}$$

$$R_{ij} = O_i T_j / S \quad (2),$$

where S is the GDP measured in “purchaser's prices”.

For any future point in time (indicated by the asterisk), the same equation holds. That is,

$$R_{ij}^* = O_i T_j^* \quad (3)$$

Dividing equation 3 by equation 2 yields

$$R_{ij}^* / R_{ij} = R_{11}^* / R_{11},$$

which can be rewritten as

$$G_{ij} = G_{11}, \quad (4)$$

where G_{ij} is the *growth ratio*, R_{ij}^* / R_{ij} , and G_{11} is the internal growth ratio of the first sector. Note that subject to the assumption, the growth ratio of the value of the transactions between every pair of industries is identical. This implies that **under natural growth patterns, all inter-industry (and intra-industry) transactions grow equally fast**. In the long run, this is not so, as inevitably, some industry may overtake another in importance, or the assumption of statistical independence break down.

8. DELAYS IN INTER-SECTORIAL TRANSACTIONS

A country without a functioning financial or functioning energy sector or a functioning manufacturing sector will stop construction from starting, running or finishing, with various time lags between event and impact. The current paper safely ignores the time delays, because it deals with annual (StatsSA, 2008) production.

9. DISCUSSION

Just as the introduction of micro-finance is an important prelude to the introduction of macro-finance, so too is the introduction of micro-construction an important prelude to the introduction of macro-finance. Small scale construction comes before large scale construction. Similar scaling up is indicated for all the other sectors of the economy.

In a dysfunctional, post-conflict country, a complete column and row corresponding to an industry may be zero or missing from the Inter- and Intra- sectorial Gross Industrial Product matrix. In the more common, more

complex situation, two or more rows and columns may be zero, and have to recover their previous status through careful and innovative reconstruction and development before the economy can once again function. In an extreme situation, every Reliance or relationship between the different sectors of the economy may be missing.

Assume that we study in particular an economy where the construction sector is non-existent as a result of conflict. In Table 3, all the formal figures will be zero. They need to be brought back gradually to their target ('normal') values as shown (assuming a similar industrial profile to South Africa is required). Because of constraints on donor funding, and lack of support from the other input industries (in particular, the manufacture of material and tools essential for building, labelled "Make"), the target cannot be achieved immediately, but has to be achieved in staged phases.

In general, more than one sector of the economy will be devastated and to different degrees, but this does not detract from the central argument of this paper, that all devastated sectors need to be scaled up from nothing, through diminutive values, to the ultimate target.

10. CONCLUSION

This paper reported on an original investigation into the quantitative role ("Reliance") that each primary industry has on every other primary industry in South Africa. This leads to the argument that it is often necessary to "reconnect" an entire economy if particular sectors are to rebound.

This paper has derived a complete matrix for all industries in a functional, working economy. All industries are inter-dependent in a matrix, called the *Reliance Matrix*. Although the Reliances differ in magnitude, all are equally vital for reconstructing a functional country.

There is a need to initially use innovative and best-practice methods, and not just reintroduce methods that may have existed in the past. Innovative Development refers to development that applies innovative (previously unthinkable) ways the available physical and political structures to rebuild the nation and convert the informal economy into a formal economy.

In addition to rebuilding the economy, the reconstruction process has to rebuild all the fabrics of society and the connections that make such a society function effectively. This means providing temporary scaffolding (e.g., shelters to be replaced by permanent, culturally acceptable housing; providing temporary foreign aid and workers, to be replaced by permanent local funding and local workers.) The interim, initial, pragmatic (*ad hoc*) procedures that were adopted as a matter of expediency need to be replaced with best-practice procedures, almost as if Business Process Re-engineering had been implemented for the country.

Society must be rebuilt; Housing must be supplied; Jobs must be created; Daily life has to be restored – and these functions often need to be achieved with many, small successes.

11. FURTHER WORK

Further research needs to be done in establishing ways to bootstrap the economy. The way appears to be clear to undertake research into innovative initial ways to start develop all sectors of the economy being reconstructed, and continuing to grow all missing components in a balanced way.

Work needs to be done on using e.g., Zimbabwe's hyperinflation as a case study. At the time of writing, the GDP was effectively zero, with all transactions occurring in the parallel informal economy. (Conventionally, only an estimate of the informal sector is included in GDP because of the impossibility of collecting the data.) It is not expected that a “big-bang” reform will be possible for all sectors. All sectors are interdependent. Nevertheless, the construction industry, the property market and the deeds office are key enablers to rebuilding the country and obtaining foreign aid.

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PROPERTY INVESTMENT OPPORTUNITIES IN ZIMBABWE

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ABSTRACT

Purpose of paper

Zimbabwe is currently considered as a very risky investment environment. This paper outlines some property investment opportunities that are present on the Zimbabwean market.

Methodology

Surveys of the various components of the Zimbabwean real estate market were undertaken in 2003 and updated in 2007.

Findings

In spite of the political turbulence, a number of investment opportunities exist in Zimbabwe, especially in the retail and residential sectors.

Research limitations

Although some comments are made about more recent developments, the extreme turbulence of the political environment inhibited a more recent systematic survey.

Practical implications

Investment in most developing countries; Africa in particular, and more so Zimbabwe, is considered risky. The paper attempts to provide some guidelines to potential property investors in Zimbabwe.

Keywords: Property investment, Zimbabwe, hyperinflation, land rights

1. AN OVERVIEW OF ZIMBABWE'S CRISIS ECONOMY

1.1 Introduction

Zimbabwe earned its political independence from Rhodesia's unilaterally declared independence from Britain, in 1980. The resident population is 11,550,000 with about 4,152,234 people residing in the urban areas (Zimbabwe Government, 2002). About four million Zimbabweans are estimated to be outside the country. Administratively its capital city is Harare. Bulawayo used to be the largest industrial city. The shrinking of the economy in the last eight years has affected this position, with a lot of industries closing down in Bulawayo. Economically, agriculture used to be its main source of income, accounting for up to 55% of exports as of 31 January 2003, while exports were dominated by unprocessed primary commodities, to the tune of 80%. (Barclays Bank, 2003)

The extent of the decline of Zimbabwe's economy in the period 2000 to date has been among the most severe in the world. Inflation surged from just under 20% in 1996 to 239% as of end of March 2003. The inflation rate is currently (March 2009) in the region of 235million% per annum. The Zimbabwe dollar devalued from Z\$28 to US\$1 free falling to Z\$5.4billion to US\$1 as at November 2007. The loss of value of the currency became the major driver of inflation. This led to replacement cost pricing resulting in vicious circle of inflation feeding on inflation.

1.2 Lack of confidence in the Economy

Political interference, fast track land redistribution, loss of rule of law and property rights, led to withdrawal of donor funds. This in turn led to a poor current account, resulting in lack of confidence in the economy. This scenario, coupled with the delicate balance of an integrated economy opened up arbitrage opportunities, led to opportunities for speculation. One of the indicators of this was bipolar pricing in the economy, with a formal market price for exchange rates and a parallel market price, two prices for fuel and one parallel market, and the same for other commodities where there are government gazetted prices and market related prices. Speculators were purchasing commodities in the formal controlled market and selling in the parallel market. The formal sector was not viable because companies were buying inputs at parallel market prices but being forced to sell at controlled prices. The result was that industry failed and stopped production resulting in commodity shortages.

The government did not want to make sacrifices that came with the indigenisation of the economy, in the form of reducing fiscal expenditure. Up to the year 2000, the economy was bolstered by largely white commercial farmers, multinationals in the mining sector, banking and manufacturing. This meant therefore any process of wealth transfer would

come at a cost and everybody needed to make some sacrifices. The government however, instead of reducing budget deficit, started printing money and forcing exporters to sell their hard currency earnings at ridiculous exchange rates to the Reserve Bank. As a result of sub-economic exchange rates exporters reduced production, leading to further reduction of foreign currency for the country. The issues at the centre of the economic collapse were summarised by analysts as follows;

- () lack of confidence in the economy because of poor balance of payments situation, which was apparently in itself triggered rightly or wrongly by political decisions and actions around the issue of indigenisation of the economy particularly land reform.
- () Western sanctions and outcry over the land reform are viewed by many as a contributing reason for Robert Mugabe staying longer than he should have.

1.3 Property rights and lack of rule of law

The land reform programme created a precedent for absence of respect of rule of law and loss of property rights. This was however largely limited to farm land areas. Property rights in the cities were largely maintained except for peri-urban farms which were also affected by land invasions. The government later removed the squatters from peri-urban settlements through the internationally publicised *Operation Murambatswina*.

1.4 Corruption

Another by side effect of the economic situation was extensive corruption and speculation, among others in the form of arbitraging. Examples include people buying dual listed shares from the Zimbabwe Stock Exchange, which were cheap buys because of exchange rate position and selling at the London Stock Exchange reaping multiples of their original investments.

There were also parallel market foreign currency dealings, all which could earn people multiples of their capital even in USD terms. Some people also had access to hard currency from the Reserve Bank, which was being sold at ridiculously low rates. This was the same money that had been taken from exporters by Government at very low rates - sometimes as little as ten times less than market related parallel trading levels. These were usually people with government links. They would buy currency at cheap prices from the Reserve bank and sell it on the parallel market sometimes for as much as twenty, or thirty times. Repeatedly using that local currency to buy more hard currency at the Reserve Bank, enabled them to become USD millionaires in just a few weeks. At one point it became so bad that these speculators controlled up to 90% of the Reserve Bank local currency cash that was in circulation. They would keep

this cash out of circulation so that that they could trade easily with out being limited by banking rules.

1.5 Foreign currency shortages

It has already been mentioned that at the core of the country's crisis is the shortage of foreign currency. This is what has been driving inflation, speculation, corruption, commodity shortages and many other problems the economy has been facing. It is some analysts' view that there is a chicken and egg relationship between western (in particular British), and ruling party political decisions and actions. whichever version is correct, the bottom line is that both led to shortages of foreign currency. Additional side effects that led to further shortages of foreign currency was that multinationals and other exporters lost confidence in the economy and either reduced production, closed shop altogether or found ways of keeping foreign currency earnings outside the country.

1.6 Local currency cash shortages

Hyperinflation meant that the population needed more and more cash to buy commodities. On the other hand cash barons were doing money laundering so that they could trade in foreign currency on the parallel market. As of November 2007, the Reserve Bank was quoted saying that of the Z\$76 trillion cash supposed to be in circulation, only Z\$2 trillion could be accounted for by the Reserve Bank. Z\$65 trillion could not be accounted for because it had been taken out of circulation by speculators. The cash squeeze created two prices for commodities and two exchange rates for foreign currency. The cash price was as much as half the price of a cheque or transfer payment system price. Consumers needed cash so desperately that cash was actually on sale, for up to 30% more than the value.

The bipolar pricing system created an arbitrage opportunity for people to trade between this differential. People would buy foreign currency using the cash exchange rate which was half that of the transfer or cheque rate. They would then sell the foreign currency using the transfer rate and make double the amount of Zimbabwe dollars they had at the beginning. Repeating the process, they could double their hard currency every day. One impact on the property sector was the building, through some of this wealth, of massive mansions; some as big as 3000 square metres in size.

1.7 Banking crisis of 2003/4

In the period up to 2004, banks had started trading in non core activities like using depositors funds to buy and sale commodities, property in land banking, foreign currency parallel trading. Up to this point fund management activities were not fully regulated. Banks were in some

instances abusing the liquidity support from the Reserve bank, to speculate in the parallel market or in the commodities or property market, because such support was very cheap in comparison to returns they were making in these alternative products.

These activities fuelled local currency depreciation and inflation because some banks would use their deposits to create artificial demand, and then hold the commodities creating artificial shortages before reselling at exorbitant prices. The new Reserve Bank Governor in 2003 took the banks to task for holding the market at ransom through monopolistic tendencies. He introduced tighter banking rules and tightened liquidity support that was being misused by some of the banks. The result was a liquidity crisis among some of the banks because their cash had been locked up in commodities or properties. The affected banks were put under judicial management. The Reserve Bank then gave them conditional liquidity support and later had three banks amalgamated because they had failed to pay back that support. One bank collapsed for good.

1.8 Collapse of credit facilities and commodity shortages

Hyperinflation meant that the credit market collapsed in the country. Everything was now being purchased for cash, be it houses, cars, building materials and even the country was now failing to get credit lines even for supplies such as fuel and other critical imports like electricity. This meant that property developments had to be financed through advance payments, and this required very heavy cashflow needs from financiers. Commodity shortages meant that construction logistics became very difficult but more so building contracts needed to be revisited.

The supply and fix contracts could not be implemented. The concept of approved or preferred suppliers could not be followed. Many factories reduced production or closed entirely because they could not get inputs, business was not feasible with their cash losing value while they are running around looking for supplies. Businesses were buying less units than what they would have sold because of funds losing buying power in the interim between sales, and purchases for production of new units.

1.9 Economic outlook into 2008 and beyond

Zimbabwe's greatest strength at present is its very educated and strong workforce, its infrastructure and under-priced property assets because of exchange rate distortions, if not even the undervaluation of the local currency. Tenure and property rights in the urban areas are secure and have not been threatened. Government is unlikely to go the route of expropriating properties considering its recent back-tracking on price controls because of the negative results that came out of this action, and the standing social contract between industry, government and labour. This

is an opportune time for investors to buy or develop at the bottom of the market. Properties are still under priced in comparison with the regional market and rentals bound to grow to regional levels.

Zimbabwe's economy has been largely subsidised by government or prices controlled resulting in sub economic prices for services and commodities. The costs of electricity, water, fuel have for a long time been way below international and regional benchmarks. Judging by what happened to Zambia, Mozambique and Malawi, all these subsidies are bound to fall away and cost of living to go up to regional levels. This again means the time to enter into the market is now. While the rest of the world is expecting a depression, Zimbabwe's property market and maybe Africa in general will be providing opportunities for capital growth as economy corrects from current depression to regional or international benchmark levels.

2. PROPERTY INVESTMENT OPPORTUNITIES

2.1 Opportunities on the Zimbabwe stock exchange

In the period 2003 to 2007 four property companies listed on the Zimbabwe Stock Exchange (ZSE) The ZSE was in 2006, rated the best performing stock market in Africa, and certainly one of the best in the whole world in terms of returns realised by investors during that year. This was because many investors wanted protection from hyperinflation but at the same time needing liquidity and easier exit mechanism from property when they wanted to. A good percentage of investors did not want to invest directly into property because of the above constraints that direct investment provides.

These four counters have performed exceptionally well even in real terms, that is, over and above inflationary levels. It would appear that there are more property companies being lined up for listing as the market responds to investor needs, with a view to giving investors more options. Most of the listings are as a result of already listed companies that are unbundling their properties into separate vehicles and listing them separately, their objective being to unlock more shareholder value that is lying unrealised in properties, which because they are not part of the core business of the listed businesses, remain undervalued by the stock market. Unbundling them allows their true value to be realised as investors become interested in their performance by themselves on the stock market. In many instances owner-occupied properties are underperforming because they are not commercially managed. Unbundling them into separate companies then means that the occupants, the core businesses of the mother companies now have to pay rentals.

The property companies listed on the stock market are;

- (i) *Dawn Properties Limited*, which was the first to list. This company is structured as a Variable Rate Loan Stock company. This company was born out of the unbundling of the Zimsun Leisure Group.
- () *Mashold Properties* – which again was as a result of the unbundling of an existing conglomerate by collapsing the conglomerate's properties into a separate vehicle, which was in this case reverse listed through an already listed company which had become a shell.
- () First Mutual Life Insurance Company in 2006 also put together property vehicles from all its properties, forming *Apex Properties* and then listed the company. First Mutual Life is also listed.
- () *ZimRe Property Investments*, was created out of the properties owned by the ZimRe conglomerate in August 2007.
- () Another property company that is apparently earmarked for listing is *Pinnacle Properties*. This is a property development company that has gathered some stock over the years especially during the crisis, where the best way to hedge against inflation was to put money in property.

There has also been a couple of property unit trusts created by asset management companies. These include Kingdom Bank Asset Management, African Banking Corporation Asset Management, TN Financial Services plus a few others in the process of formation.

In the past six to eight years of the country's crisis, dual listed companies like Old Mutual, Wankie Colliery and others have been used as a mechanism to bring FDI funds into the country for investments and to repatriate the funds out of the country. Investors would buy these counters in London or the JSE and offload their shares on the ZSE. They then take their money and invest within the country. When they want to exit, they would then purchase the shares again on the Zimbabwe Stock Exchange and then sell on the LSE or the JSE to recover their capital plus returns. The ZSE has at all times during the crisis performed well above inflation in real terms (as much 250,000% versus inflation of just above 100,000% at the end of 2007).

2.2 Opportunities in the residential property market

2.2.1 Opportunities in the sales and acquisitions market

An informal survey conducted with estate agents in the two major cities revealed that demand for residential properties far outstrips supply.

Zimbabweans outside the country largely affect the residential property asset market. Thousands of professionals have gone to the UK and other European countries, taking advantage of the exchange rate to

buy residential assets for both investment and family use. Because other asset portfolios in the country have not been performing well, the residential property market also became a hedge against inflation for many institutional investors and high net worth individuals. Capital moves across to the money market when money market rates increase. The same situation prevails in Bulawayo and other smaller cities though to a lesser extent.

In the period 2003 to 2006 the number of Zimbabweans outside the country participating in the purchase of completed houses and the residential market in general, has been declining. This has largely been due to unfavourable formal exchange rate and tightening of rules around parallel market activities. The more dominant players became the corporate world, with more and more companies trying to secure their liquidity.

The effective demand from Zimbabweans in the diaspora is very big – probably millions. This demand consists largely of young people who have not acquired houses as yet. It is expected that the recently formed coalition government will eventually result in substantial changes. These changes are expected to unlock many opportunities, among which will be the streamlining of exchange control regulations, thus allowing Zimbabweans in the diaspora to benefit from realistic exchange rates.

It is envisaged that there will be big opportunities in housing development. Service providers in the development sector have a wealth of experience in managing developments even in the most difficult circumstances. These will be very pivotal in efficiently rolling out sales stock. External investors can enter into core-ownership arrangements with local pension funds and other institutional investors.

2.2.2 Opportunities in the rental stock market

There is a serious lack of rental housing in Harare, resulting in rental escalations of up to 150% per annum as at 2003 and in excess of 70 000% per annum in 2007.

The demand demographics in Zimbabwe are expected to shift over the next couple of years. In spite of rampant inflation, the cost of living has been cheap in comparison to region and internationally. Rentals have been very cheap and the same goes for actual property prices.

Cost of living is expected to adjust fast to come to par with regional levels. However, increasing income per capita and addressing of the unemployment levels currently standing at 80% will take a while. This means a large section of the populations will be pushed a couple of notches down the class ladder. A large part of the population will be low income and at best middle class.

The implication is that big housing opportunities will exist in the middle and low income levels, where the population demographics will be favourable for mass production of stock.

2.3 Opportunities in the retail property market

2.3.1 Development and redevelopment opportunities

The development of large scale retail projects has declined over the last decade because of the larger escalation risks on large capital projects and higher non-completion risk that could arise out of the many logistical problems in the environment. Developing in phases and smaller chunks as a mitigation measure has become popular.

The Harare Metro area, which covers Chitungwiza, Norton, and Mazoe has a population of almost five million people. The total GLA of shopping centres, which is less than 220,000 square metres (see table 1), is less than the overall demand. While it is true that unemployment is estimated at around between 60 – 80 %, the population still has significant disposable income.

Table 1: Shopping Centres in Harare (Source: survey)

Shopping centre	Size (m²)	Existing by 2003 or after
Westgate	54,000	2003
Sam Levy	52,000	2003
Eastgate	16,000	2003
Joina Centre	12,000	After
Chisipite	23,000	2003
Arundel Village	12,000	After
High glen	15,000	2003
Avondale	21,000	2003
Angwa City	6,100	2003
Malbereign	11,000	2003
Kensington Centre	10,000	2003
Macro Mart	6,300	2003
Jaggers	10,100	2003

There are opportunities for the redevelopment of shopping centres like Avondale and Chisipite. The demand is larger than the space in each of these old centres. The Joina City and centre which was recently finished was well oversubscribed by customers looking for retail space. There is still very high demand for retail space.

2.3.2 Opportunities for property funds to invest in retail centres

Opportunities also exist for the unitisation of existing portfolios by pension funds, insurance companies and other institutional investors. In the aftermath of the crisis most of these property owners will be looking for liquidity. However because their capital is locked up in large properties, property unit trust funds will be the mechanism to liquidate their holdings in these properties. These will present opportunities for new investors to enter the Zimbabwean market, while the prices are still down. This way the investors coming in early will benefit from growth potential from depressed prices to regional property prices.

2.3.3 Managing for investor value in the crisis circumstances

Many landlords have been forced to revisit lease agreements because they were no longer appropriate for the prevailing environment. Some property owners even went as far as indexing rentals paid in local currency, to hard currency amounts. Authorities however spoke against this practice saying that local currency was the only legal tender in the country. Rentals were also reviewed quarterly at first and monthly as inflation kept increasing. Since there was very little development of new shopping centre properties, demand for this space increased phenomenally. More people were also leaving formal employment and forming businesses. The retail sector has been among the most popular of such businesses, hence the increase in demand for retail space.

2.4 Opportunities in the tourism sector

Zimbabwe has a number of major resort areas of international repute. These include the Vumba Mountains, Nyanga Mountains, Great Zimbabwe, the Matopos, the Khami Ruins west of Bulawayo, the Hwange national park, Lake Kariba and of course the Victoria Falls. The factor underpinning the business potential of the tourism property sector is the diversification of the tourist markets that has happened during the crisis era, to attract more tourists from the East. There is also potential in restoring facilities and infrastructure that was run down during the melt down.

2.5 Opportunities in infrastructure development

Opportunities abound in regularising farming land. Land supply during the crisis had become uncontrolled, and therefore valueless, commodity. Land property surveying in line with the new farm divisions need verification and legal ratification. There is a chance that some of this may be reversed, but it is also possible that in some areas this action by the new government may be resisted by people on the ground.

Forestry plantations, conservancies, sugar plantations in the lowveld to the south, and tea plantations in the eastern highlands will need restoration. Large game parks like the Hwange and Gonarezhou parks will require infrastructure upgrading. There are opportunities in upgrading road infrastructure, communications infrastructure, transport and energy properties. In the case of roads upgrading, the existing government had already put in place relevant Build Operate and Transfer regulations. Several toll roads concessions are at various stages of negotiation. Precedence had already been set through one rail development concession and the Limpopo Bridge toll concession.

2.6 The land question and property rights

The land reform policies of the Zanu PF government did not affect the cities. All urban land is still on free hold title. To this extent investors should not be concerned about participating in urban property investment. In the case of farmland, however, the question of *bona fide* ownership will remain paramount even going into the future.

3. CRITICAL MARKET INFORMATION FOR INVESTORS

Table 2: Key property investment advisory companies (Survey P. Ndlovu, 2007)

Advisory Company	Comment
Southland Facilities Management	info@southpeople.biz
CB Richard Ellis Zimbabwe	info@cbre.co.zw
Knight Frank Zimbabwe	kfz@kfz.co.zw

Table 3: Local institutional investors for possible collaboration with external investors

Communications Industry Pension Fund
Zesa Pension Fund
Railways Pension Fund
Local Authorities Pension Fund
Old Mutual Properties
Joina Development Company
Zimnat Life
First Mutual Life
Cresta Hospitality
Zimsun Hospitality Group
The Rainbow Tourism Group
Intermarket Life
Intermarket Building Society
Cabs Building Society
Beverly Building Society
OK Zimbabwe

Meikles Zimbabwe TM Retail Chain

Table 4: Building costs movement in the period 2003 to 2007

Type of building	Average building cost (US\$/ m ²)	
	2003	2007
Residential		
- High Density Rural Housing	6.00	34.00
- High Density Permanent Housing	38.00	134.00
- Medium Density Permanent	165.00	280.00
- Low Density Permanent	405.00	538.00
Commercial		
- Office high rise	410.00	608.00
- Shop/Retail	398.00	493.00
Industrial		
- Warehouses	193.00	250.00

Source: Personal communication, Turner & Townsend Zimbabwe, Mahachi Gwaze & Partners Zimbabwe

Table 5: Open market capital values for some types of properties in Harare

Type of property	Average capital values (US\$/m2)	
	2003	2007
Residential		
High Density Housing	\$40.00	\$140.00
Medium Density Housing	\$179.00	\$308.00
Low Density Housing	\$450.00	\$600.00
Commercial		
Shops/Retail	\$460.00	\$667.00
Offices	\$458.00	\$567.00
Industrial (Warehouses and Factories)	\$216.00	\$280.00
Service housing stands		
High Density Stands	\$0.30	\$1.00
Medium Density Stands	\$3.00	\$10.00
Low Density Stands	\$10.00	\$35.00
Agricultural		
Farms (peri-urban) per hectare	\$10,000.00	\$29,000.00
Farms purely agricultural per hectare	\$1,800.00	\$2,100.00

Source: Ministry of Lands and Agriculture, Southgate & Bancroft.

Table 6: Rent levels for some types of properties in the major urban centres

Type of property	2003 (US\$/m2)	2007 (US\$/m2)
Residential		
High Density Housing	\$0.28	\$0.50
Medium Density Housing	\$0.60	\$1.25
Low Density Housing	\$0.95	\$2.50
Commercial		
Shops/Retail	\$1.70	\$4.00
Offices	\$1.20	\$2.80
Industrial		
(Warehouses and Factories)	\$0.45	\$1.00

Source: Survey CB Richard Ellis, Knight Frank Zimbabwe

Rentals are very low in comparison with region, where commercial office rentals may be as high as US\$5 to US\$10 per square metre. These low rentals mean that prices of properties are also lower in comparison to region.

4. CONCLUSIONS

The fact that Zimbabwe has many positive aspects, like the infrastructure, the calibre of the people, their education, general living standards, peace and low to no crime rate makes it attractive in terms of the potential the country has, especially if political change could be realised. Some investors are achieving very good returns even under the prevailing circumstances. Other investors actually prefer the current situation because they are making money while everybody else is concentrating on smoke screens. They believe the current situation offers them protection from global competition, because other players are currently shunning the country.

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PROMOTION OF ETHICAL CONDUCT IN THE ZAMBIAN CONSTRUCTION INDUSTRY THROUGH TECHNICAL AUDITING

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ABSTRACT

Purpose of this paper

The paper examines the existence of different types of unethical practices within the Zambian construction industry and establishes whether the introduction of pro-active technical auditing on construction projects would promote ethical conduct.

Design/Methodology/Approach

The research approach includes the use of literature review which draws on significant sources that address fraudulent practices on construction projects, a questionnaire survey eliciting views of stakeholders on different aspects of technical auditing and analysis of an audited

construction project as a case study to establish whether existing institutions have the capacity to expose and prevent such criminal activities.

Findings

The introduction of pro-active technical auditing, through the appointment of technical auditors and commencement of audits at planning stages of projects, would be an effective measure in promoting ethical conduct.

Practical Implications

It is hoped that information brought out in this study may be useful in raising awareness of unethical crimes, development of prevention strategies and assist in developing necessary policies and guidelines for the introduction of regulatory technical auditing of construction projects in Zambia.

KEYWORDS: Technical auditing, Unethical practices, Construction industry, Zambia

1. INTRODUCTION

Today, the world is clamping down on unethical practices such as corruption, fraud, bid-rigging, bribery, collusion, coercion, misrepresentation of facts and extortion. As unethical practices become sophisticated, there is increased realisation that financial auditing on its own may not be adequate to detect and combat unethical practices that may be prevalent in the construction industry.

One of the most effective tools that the construction industry has in the fight against corruption is technical auditing. At the heart of technical auditing are the core values of transparency, accountability, fairness and responsibility. Technical auditing can be defined as an independent, objective assurance and consulting activity designed to assess both the effectiveness and efficiency of an organisation's operations (Petts Consulting, 2003).

The government of the Republic of Zambia (GRZ) has been spending huge financial resources in improving building and road infrastructure facilities. Despite the colossal expenditure on infrastructure investment, the information from various sectors of the industry asserts that the client is not getting value for money. The genesis of these problems emanates from lack of effective technical auditing to harness quality and cost control management in the construction industry particularly on government projects. This development is a source of concern and requires sustainable solutions to resolve them. It is necessary to carry out external independent audits to enable government get value of expenditure on the projects.

The call for technical auditing comes at a time when there is concern about quality and value for money of construction projects. Poor project delivery has been attributable to several factors that are seemingly entrenched within the Zambian construction industry. The most common at the centre stage of problems faced in the industry are economic crimes such as corruption, fraud and collusion. The problem has been exacerbated by lack of a clause on technical auditing in our standard forms of contract and a general lack of capacity in vital auditing institutions in Zambia.

Therefore, establishing technical auditing capacity and procedures in the country could be a challenge. The National Road Fund Agency in Zambia has previously conducted technical audits on some of its projects, most of which were carried out by foreign firms on donor funded projects.

Apart from assuring value for money to clients, technical audits offer benefits to parties involved in projects, such as: lowering the cost of finance by reducing or eliminating corruption; identifying fraud situations which could alert financiers of projects to take appropriate action; recovery of any fraudulent financial loss; minimising weaknesses in project procedures, processes and administration; strengthening professionalism in the construction industry; building construction industry credibility; and enhancing accountability to taxpayers.

2. PREVALENT UNETHICAL PRACTICES

The construction industry is diverse and has many different players. A standard definition of the Zambian construction industry comprises five sectors namely: consultancy; contractor; manufacturing; supply and clientele (GRZ, 1979). The consultancy sector, also referred to as design, is concerned with employer advice and project monitoring through design, contract documentation and project supervision.

The contractor or assembly sector is predominantly concerned with site activities and involves the physical erection of facilities by contractors that implement designs by the consultancy sector. The manufacturing sector produces building materials, plant and machinery for the contractor sector. The supply sector is responsible for the importation and supply of building materials, plant and machinery. And finally, the clientele sector represents employers, those that require the services and products of the consultancy and contractor sectors.

In an effort to fight corruption in the construction sector, Transparency International (2007) summarised unethical activities that can take place during the different phases of a construction project. It is very difficult for anyone who does not understand construction processes and procedures to uncover illegal activities in the sector. The study identified seven prevalent unethical practices at pre-contract stage, that is from planning to contract award, namely: fraudulent contractor qualification; initiation of

complex projects by government officials or persons in authority; manipulation of pre-qualification criteria by the consultant; disclosure of lowest price to the preferred contractor; non disclosure of interest; non disclosure of poor financial status; and collusion.

At post contract stage, which is the physical construction of the facility up to the end of the defects liability period five prevalent unethical practices were identified. These included contractors supplying inferior quality materials; delay of the issuance of a payment certificate; fraudulently increased variation claims; extortion by client's personnel; and falsely increasing the quantities of certified works. It would, therefore, be necessary to combat practices that abuse public funds in the construction sector through appropriate strategies such as technical auditing.

There are various reasons why a technical audit may be called on a construction project. Proactive auditing is where the auditee initiates the process due to statutory requirements such as tax compliance. Such an audit is usually pre-arranged and the auditee has documentation and information readily available. Therefore, regulatory technical auditing is proactive (Chatterji, 2001). On the other hand, reactive auditing is usually triggered by suspicion of wrong doing. It is unannounced and usually results into a forensic audit. Forensic auditing could be defined as the application of auditing skills to situations that could lead to prosecution in courts of law (Chatterji, 2001).

Technical audits offer various benefits to clients such as assuring value for money, transparency and accountability. Consultants and contractors that have been subjected to audits and come out clean usually gain confidence and openly discuss their projects (Singh, 2006).

3. METHODOLOGY

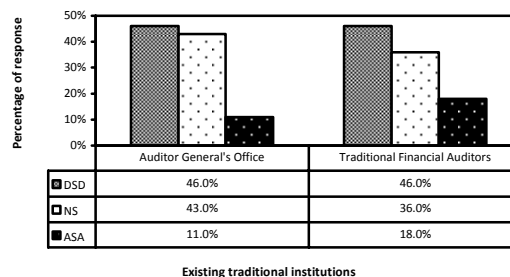
By utilizing the findings of peer-reviewed research and studies, the paper reviews the existence of prevalent unethical practices on construction projects in Zambia. The paper also considers whether the introduction of regulatory technical auditing is a step towards reducing these crimes.

Primary data was collected through self administered questionnaires. The objective of the study was to establish whether existing institutions had the capacity to expose and prevent such criminal activities. The study further examined acceptance of technical auditing, its procedures and its efficacy in reducing unethical practices in construction projects. A judgemental sampling approach was used for the survey, where respondents were purposively selected to provide a representative sample of the Zambian construction industry. Auditing firms were also included in the sample to ascertain their capability in conducting technical audits. The sampling was disproportionate, and as such the need for stratification. Sixty questionnaires were distributed with a response rate of 82 percent, which was determined to be acceptable.

These unethical activities were then utilised and analysed using a case study to investigate their existence on construction projects in Zambia. The subject of corruption and unethical practices is considered sensitive and information is normally concealed. Consequently, it is difficult to uncover these practices if they have occurred. This paper focuses on the findings from the case study.

4. RESULTS OF THE STUDY

In advocating for the introduction of regulatory technical auditing, the survey sought to establish whether traditional institutions with the mandate to audit public construction projects had the capacity to carry out this function. One such organisation in Zambia is the Auditor General's Office (AGO). The survey, as shown in Figure 7.1 revealed that 46 percent of the respondents indicated that AGO had no capacity to carry out technical audits, where as 11 percent thought AGO had capacity and 43 percent were not sure. Because of the high percentage of respondents unfamiliar with AGO capacity, further investigations would be required to establish the capability of AGO to undertake technical audits of construction projects. This was also the case with traditional auditing firms (TAFs) in Zambia, where 36 percent of the respondents were not sure about the capacity of TAFs to carry out technical audits. However, the majority, 46 percent of the respondents indicated that TAFs had no capacity compared to 18 percent who thought they did as indicated in Figure 7.1.



DSD-Disagree to Strongly Disagree; NS-Not Sure; ASA-Agree to Strongly Agree;

Figure 7.1: Percentage breakdown of perceived capacity by AGO and TAF to undertake technical audits

4.1 Technical audit procedures

From the survey it was established that existing institutions with the mandate to carry out technical audits were perceived not to have capacity to carryout this function. Therefore, the study examined the type of training that would be appropriate for those who should carryout such audits. Figure

7.2, shows that 45 percent of the respondents felt that technical auditors should have construction related backgrounds compared to 3 percent who felt that auditors should have an accounting background. Though 10 percent were not sure, 41 percent preferred technical auditors with both construction and accounting backgrounds. In the absence of technical auditors with both construction and accounting related backgrounds, the concept of traditional accounting auditors collaborating with experts from the construction industry to form joint ventures for the sole purpose of executing technical audits should be considered for the time being and embraced as acceptable.

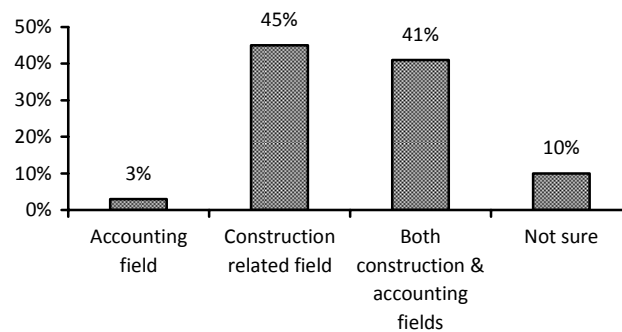


Figure 7.2: Percentage breakdown of recommended technical auditors' professional background

Technical audit procedures such as audit entry, appointment of technical auditor and mandatory auditing regulations that could be incorporated in contracts in the Zambian construction industry were also investigated. Results as shown in Figure 7.3, indicated that 43 percent of the respondents preferred the appointment of a technical auditor at the planning stage of the project life-cycle, while 20 percent had their preference at tender stage and the same percentage at the practical completion stage. The contract award stage was preferred by 11 percent of the respondents while 6 percent were not sure at which stage of the project life-cycle technical auditors should be appointed.

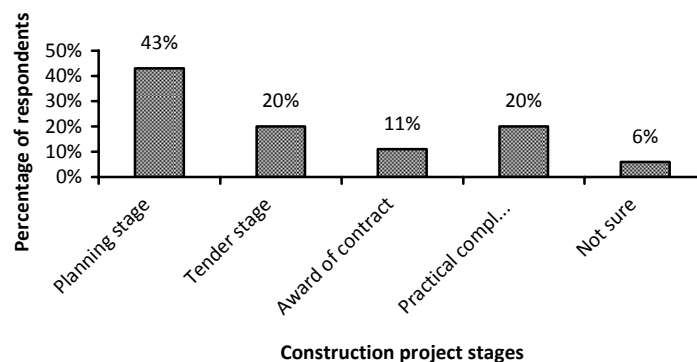


Figure 7.3: Percentage breakdown of stage technical auditors should be appointed

As to when the audit should commence, results revealed that 65 percent of the respondents stated that audit commencement should be at the pre-contract stage compared to 24 percent who thought post-contract stage was more appropriate. Only 3 percent felt audit entry should be triggered by suspicion of fraud while 9 percent were not sure. From these results, commencement of a technical audit at the planning stage would be more effective in taking care of pre-contract unethical practices as well as those in the post-contract phase.

All the respondents, apart from 14 percent who were not sure, felt that the conditions of contract should include a clause on the requirement of a technical audit being executed at least once during the project lifecycle.

5. CASE STUDY: THE PRESIDENTIAL HOUSING INITIATIVE

The audit of Presidential Housing Initiative (PHI) was as a consequence of reactive auditing. The Auditor General's Office (2002) commenced the audit following reports of abuse of office and misappropriation of funds and its findings were made public. It was reported that PHI had ignored tendering procedures in the procurement of goods and services.

5.1 Pre-contract stage

5.1.1 Fraudulent contractor qualification

Fraudulent contractor qualification is where a bidder furnishes false documentation regarding plant and equipment, labour and the company's qualifications in order to win a contract.

PHI engaged 15 contractors to undertake various works at the Bennie Mwiinga and Twapia sites. Details of the 15 contractors were sent to Zambia National Tender Board (ZNTB) to regularize their procurement. But of the 15 contractors, only 5 were approved and authorised by ZNTB. One of the reasons ZNTB did not approve the other contractors was failure of the companies to meet minimum standards in terms of experience and capacity.

The concerns raised by ZNTB in the engagement of the remaining 10 contractors could be interpreted as evidence of the contractors submitting fraudulent documentation to PHI before award of the works. Lack of procedures and guidelines on the procurement of contractors at PHI provided a weakness in the system and an opportunity for fraudulent activities.

5.1.2 Initiation of large projects

Initiation of complex projects by government officials or persons in authority in order to make money by requesting favoured contractors to add percentages to their contract sums for the benefiting individuals was confirmed by Transparency International as being at the core of the problem in Zambia. This activity was experienced on the PHI project.

The Auditor General's (AG) report (2002) confirmed that K7 billion was applied on activities not related to PHI mandate. One project that stood out was the construction of the Institute of Democratic and Industrial Relation Studies building. This project was not budgeted for and had nothing to do with PHI but funds meant for PHI were utilised through payment of K160,492,422 in respect of designs and related consultancy fees. At the time of site inspection in July 2007, the construction works which had reached lintol level had been abandoned and referred to the courts of law. As the project was not budgeted for, an opportunity was available for the misapplication of PHI funds. The AG report noted that the misapplication had a negative impact on the operations of PHI. The PHI chairman used his position to initiate the project which was tantamount to abuse of authority.

5.1.3 Manipulation of pre-qualification criteria

Manipulation of pre-qualification criteria by the consultant so that the preferred bidder wins the contract is not an easy practice to uncover. In September 2000, PHI was assigned the responsibility of refurbishing the Mulungushi International Conference Centre and Mulungushi Village complex for the 37th Organisation of African Unity (OAU) Heads of State summit. The contract was signed on 13th September 2000 between National Hotels Development Corporation (NHDC), in which the PHI chairman had shares and MKP Holdings SDN.BHD, a Malaysian company for a contract sum of US\$ 16,842,461.77. Conditions of the contract were

that MKP, as contractor, was required to design, carryout and complete the construction works. NHDC, as employer, was required to pay the contractor 50 percent of the contract sum. The contractor was required to fund the other half of the contract. Thereafter, payments would be made to the contractor on the basis of 50 percent of the value of certified works. The works included the construction of 60 presidential villas, a 300-seater convention centre and a recreation centre. On 18th November, 2000 the contract was amended. The effect of the amendment was to make MKP Holdings as the supervising organization and NHDC the contractor. Since NHDC was not physically in existence, PHI management mobilised resources to execute the work on behalf of NHDC under the supervision of MKP.

Since there was no explanation given as to what led to the amendment of the contract, it was likely caused by MKP's lack of capacity in carrying out the works. For MKP to be considered for the contract, NHDC must have manipulated the pre-qualification criteria to justify their selection. MKP's changed position as supervisor was equally fraudulent as the company was not registered with the Zambia Institute of Architects to have been able to supervise building construction works. The AG report noted that the contract sum of US\$ 16,842,461.77 agreed on 13th September 2000 was not adjusted to take into account the changed role of MKP from contractor to supervisor.

5.1.4 Disclosure of lowest quotation

Disclosure of lowest quotation is where the estimated or lowest price is leaked to the preferred contractor so that they could quote lower and win the bid. In February, 2000, a memorandum of understanding was signed between Apex Design Architects Ltd and MKP for conceptual design, amendments to working drawings, preparation of design-and-build contract in respect of the Mulungushi International Conference Centre and Millennium City. Interesting to note was that this agreement was signed nine months before the main client NHDC entered into a contract with MKP for the same works. Though it could not be proved outrightly that there was information leakage, it was observed that MKP was the preferred contractor.

5.1.5 Non declaration of interest

Non declaration of interest is where consultants or owners do not disclose their interest in companies that are tendering for contracts. On 7th October, 2000, the PHI chairman applied to the Siavonga District Council Secretary to allocate 20 plots for PHI housing development. Later, the PHI chairman indicated that he had found a developer, Mulungushi Millennium Development Company and suggested that the plots instead be allocated to the proposed developer. Thirteen of the twenty plots were transferred to

Mulungushi Millennium Development Company Limited. On further inquiries, it was revealed that the PHI chairman and the PHI architect were directors of Mulungushi Millennium Development Company Limited. The AG report emphasized that the diversion of PHI plots and use of PHI resources to pursue interests of a private company were irregular and fraudulent. Such unethical practices could be prevented if the procurement team had clear procedures and guidelines regarding evaluation of companies.

5.1.6 Non disclosure of financial status

Clients commencing construction projects knowing that the works would encounter financial difficulties by not disclosing adequate financial status is unethical. In the case of the Institute for Democratic and Industrial Relations Studies, the source of funding for the project was not known. It was suspected that the PHI chairman syphoned money from PHI to commence this project. Due to funding difficulties, the project was later abandoned. This practice was unethical because the contractor's resources were tied up in the project. A technical audit at pre-contract stage would have established whether adequate funding was available and prevented this unethical practice from occurring.

5.1.6 Collusion

Collusion, also known as bid-rigging occurs when competing contractors tender at higher prices to ensure that a particular contractor wins the tender. There was no evidence or suggestion that contractors colluded to obtain any of the contracts at PHI.

5.2 Post-contract stage

5.2.1 Supply of inferior quality materials

Contractors supplying inferior, but being paid for higher quality materials is an unethical practice. Detection of this practice on the PHI project only became apparent when there was failure in the erected buildings. This started with complaints of door locks falling apart in most villas. In addition, after the completed presidential villas were sold, there were complaints that the roofs were leaking. The villas initially had flat roofs but barely 5 years after construction, pitched roofs were introduced as a way of correcting the failure. If this failure had been observed during the defects liability period, the contractor would have been compelled to carry out remedies. But in this case, the purchaser of the villas had to meet the unexpected cost. A technical audit through quality review would have examined test results of the concrete and asphalt layer used.

5.2.2 Increased variation claims

Fraudulently increasing variation claims and the extra money shared between the certifying consultant and the contractor is unethical. The five approved contractors referred to above were responsible for variation works amounting to K3,166,162,834 which was an additional 24 percent of the original approved contract sums. From the standard bidding documents used by the World Bank, the allowable percentage of variation was 15 percent (World Bank, 2004). The variation claims should not have been so high because all the contracts were fixed sum contracts. It was for this reason that ZNTB did not approve these variations, though PHI had already paid for them. A technical audit would have ensured that the reason, justification and authority for the variations were in order and the rates used for valuation of the variations was analysed showing detailed calculations. A technical auditor would have recommended new contracts for variations above 25 percent.

5.2.3 Extortion by client's personnel

Extortion by client's personnel for a fee from the contractor to ensure certificates are paid quickly is difficult to detect as it is normally concealed. However, this practice became evident when payment patterns were studied. In the case of transport hire for operations and transportation of building materials, whereas it took PHI long periods to pay five other companies, three companies namely Lwenga Car Hire, APT transport and Shankondo Investments Ltd were paid promptly. It was observed that for the three companies to have received their payments promptly, the paying authority could have been compromised. An opportunity for fraudulent activity was available because PHI did not have a payment system in place.

A technical audit would have recommended the introduction of a payment register where all invoice details and the date received would have been recorded. The payment periods for different types of payments would have been known and a systematic payment schedule prepared. This internal control, incorporated in the accounts department manual would have been effective in reducing this unethical practice. Signatures of who received the invoice and effected payment would have to be scrutinized. If the internal control procedure had been in place at PHI, it would have been easy to monitor who was responsible for the prompt payments for further investigations.

5.2.4 False certification of works

Cost engineers, commonly referred to as quantity surveyors, falsely increasing the quantities of certified works in order to obtain extra money from the contractor is another unethical practice. False certification of works is sometimes a source of increased variation claims. As a fraudulent practice, analysis and examination of re-measurement work could detect this unethical practice. Re-measurement is advisable for work that is going to be concealed such as foundation trenches backfilling. When contractors tender, they have an idea of quantities of items of work that are likely to reduce or increase. Contractors could therefore under price works likely to reduce and overprice those likely to increase. Thus substantial increases or reductions would not be in the best interest of the Client. It is very rare for a contractor to over price items expected to decrease and under price items with possibility of any increase.

A technical auditor would be able to trace such trends and ensure controls are put in place to reduce opportunities for fraud. A technical audit of actual work done and quantities claimed for each item in the bill of quantities and in the valuation certificate would verify what quantities to recommend. The technical audit in this case would have relied heavily on site records and documentation. Lack of comprehensive and accurate site records would be attributable to opportunities for fraudulently increased quantities of certified works. The AG office did not compare actual work done with the quantities claimed. The AG report used information from the certificates and in the absence of quantities claimed, it was difficult to have concrete evidence. The increased variations of 24 percent suggested that some quantities could have been fraudulently increased.

5.2.5 Delayed issuance of payment certificates

The client bribing the consultant to delay the issuance of a payment certificate because he does not have sufficient funds at the time the claim for payment is received is unethical. Though this practice was reported by Transparency International (2007) as a corrupt activity, there was no evidence that this activity took place at any of the PHI activities. It was not highlighted in the AG report. This could be because delayed certification would result in increase of the overall cost of the project.

6. DISCUSSION OF RESULTS

On the case study, the initial source of the problem was how PHI was formed. It was a presidential initiative, which was announced without being legislated for and any feasibility studies being prepared. When PHI was given land for construction of houses, it did not carry out a full development plan or feasibility study to provide estimates of the number of units that could be

constructed and the sort of budget required. The absence of a plan and budget created weakness in the PHI system and opportunities for unethical practices. If a developmental plan and budget had been in place, they would have been the basis of PHI guideline and procedural formulation. This in turn could have acted as an internal control and minimised fraudulent opportunities.

Of the seven unethical practices at pre-contract stage, six occurred on the PHI project compared to four out of the five at post-contract stage. According to Transparency International (2006), grand corruption in Zambia was by senior politicians. This study confirmed this practice and illustrated how it occurred and its negative effects. One way this practice could be curtailed would be to ensure that only budgeted public projects were initiated. Manipulation of pre-qualification criteria, could be prevented or minimised by ensuring that procurement guidelines that are in place are strictly adhered to. Non disclosure of client's financial status becomes an economic crime when contractors utilize their assets as collateral on potentially problematic projects due to poor or erratic funding. The study revealed no evidence of collusion, perhaps because there was enough work for qualified contractors. In addition, there was no evidence of delayed issuance of payment certificates because delayed certification is detrimental to the owner because the overall cost of the project would increase in the end.

The AG report highlighted fraudulent activities that occurred on the PHI project but lacked recommendations on how to prevent them. There was also lack of detailed technical analysis regarding quantities, drawings and specifications. It would have been these aspects that would have indicated any disparities between a technical audit and one carried out by a traditional auditor. The financial audit could therefore have been enhanced by a technical audit.

Views of respondents on technical audit procedures were consistent with those from literature. There was a perception from the survey that individuals were less likely to get involved in unethical practices if there was a chance that such misdemeanours could be discovered thus the advocacy for pro-active technical auditing. The appointment of a technical auditor and audit commencement at the planning stage were seen as necessary to take into account unethical practices at the pre-contract stage.

The findings reported in this paper suggest the need for technical auditing as one approach of combating unethical practices in the construction industry in Zambia. The study, though, had some limitations that need to be taken into consideration when interpreting the reported findings such as the high percentage of respondents who were not sure about the capacity of AGO to carry out technical audits.

7. CONCLUSIONS AND RECOMMENDATIONS

Pro-active technical auditing, through the appointment of technical auditors and commencement of audits at planning stages of projects, would be an effective measure in uncovering and preventing or minimizing unethical practices in construction. Arising from the findings reported in this paper, the following are the recommendations directed at preventing or minimising unethical practices in the Zambian construction industry.

7.1 Technical audit model

Promotion of best practice through the introduction of regulatory technical auditing and appointment of independent technical auditors at pre-contract stages of projects should be a requirement. Professional bodies would be well advised to revise their standard forms of contract to include technical auditing on construction projects.

A technical audit model based on a minimum of three audits during the life-cycle of an averaged sized project namely: pre-contract; post-contract; and the final audit should be adopted (Roads Department, 2001).

The pre-contract audit also be referred to as the “initial audit” should commence immediately after the technical auditor has been appointed or any time before the award of the contract. The purpose of the audit would be to review procurement of the project management team, selected method of delivery of the project and to highlight any risk areas and deficiencies in design and tender documentation.

The post-contract audit would commence when the project is approximately 25 percent complete in terms of contract duration. The purpose of the audit is to review management of the project, construction methodologies, determine conformance to contract provisions and to establish the expected and achieved objectives in terms of estimated costs, duration, quality and technical objectives.

The final audit should be carried out at practical completion stage before issuance of the final certificate. This audit should review the entire contract to determine conformance of all aspects. Problems encountered on the project should be evaluated and used to propose solutions for future projects. The audit can be used to obtain feedback on performance of the consultants and contractors for rating purposes for future contracts.

7.1 Technical auditing capacity

To enhance capacity, construction auditing units could be established in national auditing authorities, such as the Auditor General’s office in Zambia, that are mandated to audit all public accounts to ensure that taxpayers’ funds are properly receipted, expended and accounted for.

7.2 Project approval

National authorities responsible for regulating and controlling public works procurements, such as the Zambia National Tender Board (ZNTB) in Zambia, should ensure that only budgeted or approved public projects are procured. Approval documentation from relevant authorities such as responsible ministries or board of directors should accompany such tender documentation.

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THE OFFICE MARKET IN GABORONE, BOTSWANA

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ABSTRACT

Purpose of this paper

To provide an overview of problems and prospects of the office accommodation market in Gaborone, Botswana.

Methodology

150 office properties in Gaborone were surveyed: 46 in the Main Mall (CBD), 6 in African Mall, 23 in Government enclave, 13 in Broadhurst (BBS); 22 in Extension 6; 1 in Bontleng; 2 in Station Mall, 6 in Gaborone West; 6 in Molapo Crossing; 1 in West Gate Mall and 24 in Show grounds. The survey was carried out by interviews, observations, records searches and a written questionnaire to which a 90% response rate was obtained.

Findings

The office market in Gaborone suffers from a shortage of space and the rental market is dominated by the government, which occupies 25% of the available space. Rentals in 2005 averaged 41.09 Pula/m², with a standard deviation of 11.63Pula/m². There is a direct relationship between the increase in space occupied by Government and increase in average rentals. The vacancy rate declined from 8.5% in 2002 to 3.2% in 2005.

Value

This is the first survey on the problems and prospects of the office accommodation market in Gaborone, Botswana. It can also serve as a basis upon which government can revise its decision making criteria on allocation of commercial land to citizens and perhaps also consider foreign direct investment as an alternative to citizen empowerment

Keywords: office accommodation Gaborone and office market Botswana

1. INTRODUCTION

It is generally accepted that the property market is imperfect, exhibiting the following characteristics: highly stratified local markets, heterogeneous products, poor information flow, poorly educated participants, slow adjustments to supply and demand and a high degree of government control of the market. (see e.g. Pyhrr *et al*, 1989:9-10).

Firms prefer to settle in a centre that offers comparative advantages, such as proximity to labour markets and suppliers, accessibility to major transportation systems and convenience of face-to-face contacts. The agglomeration of firms gives rise to a nucleus city with high concentration of employments, which evolves over time in a CBD (Marshall, 1961; Krugman, 1991). The “history” of the CBD location as a result of the sunken costs and infrastructure built-in creates the first mover disadvantage and increases firms’ inertia to relocate from their CBD premises (Rauch, 1993). However, when the CBD grows and reaches a critical size, the agglomeration benefits of the CBD diminish as a result of the growing costs of traffic congestion, parking problems/shortage and the increased office density. (Richardson, 1978; Dipasquale and Wheaton, 1996).

The issues of location determinants and inverse bid rent gradient have been widely researched in urban economics literature (Clapp, 1980; Archer, 1981; Dunning and Norman, 1987; Rauch, 1993; and Bollinger *et al.*, 1998). The rent function is invariably represented by specifications that consist mainly of location characteristics of offices. On the demand side, the assumptions that firms are rational and homogenous and that it has perfect information in its location choice decision were also increasingly questioned by researchers in behavioural studies (Wyatt, 1999; Leishman and Watkins, 2004; Leishman *et al.* 2003).

The classical urban economic literature on location choice of office space is developed on the assumption that there exists only one unitary urban city centre where firms could enjoy agglomeration economies by locating in the centre. The classical Alonso’s (1964) bid rent function declines with the distance away from the CBD, and firms will have to trade off accessibility for larger office space in the fringe location.

Occupation demand for property is considered to be relatively price inelastic. This is the case in Gaborone, Botswana. The Government of Botswana is one of the major tenants of office accommodation in Gaborone. Its rented office space amounts to around 110 000m² with an annual budget of about 65 million Pula (GRB, 2004:4). Most of the landlords prefer having government as their tenant because of the security that the lease offers: the lease period is a minimum of 5 years with rent paid quarterly in advance and an option to renew the lease on a 3-year

basis. Fitting allowances are recoverable in a period of 2 to 3 years from the landlord's rental income.

The inability of government to supply its Ministries and Departments with offices within its jurisdiction and mandate has caused a high demand for private owned rented offices. The demand for office accommodation was so high during 1999 to 2001 that firms who could not get office accommodation in the mall areas decided to occupy houses surrounding the malls. This prompted the Minister of Lands and Housing to introduce penalties for tenants occupying residential buildings, with a consequent mushrooming of new office buildings and rapid change of uses / zoning of houses near the malls. Demolishing of houses and construction of new office complex was the order of the day.

2. METHODOLOGY

Data was collected using the descriptive survey method (Leedy 1997:226). The sample for the research was based on purposive selection of persons and organisations that are involved in real estate in Gaborone. A sample of 150 office properties was selected out of a population of 300. A total of 137 responses was obtained. (cf. Table 1). The research was undertaken between June 2005 and mid August 2006.

The number of questionnaires administered in each area was pro rata to the total lettable space of offices in that area and was based upon simple random sampling. For example, Main Mall constitutes 30.6% of the total office space in Gaborone, resulting in 46 questionnaires in that area. In two cases the number of questionnaires was adjusted: Westgate is occupied by one tenant (government), therefore only one questionnaire was administered. Initially Molapo was supposed to have only two questionnaires but it was increased to 6. In addition, interviews with officers from the Department of Lands were carried out using a guide interview questionnaire.

Observations, personal consultations and searches were also used as additional techniques to collect data. Consultations were held with various persons participating in one way or another in the property market such as property owners / investors, property developers, building contractors, banks and professional consultants. Searches were conducted through property files for rating valuations and offices at the Department of Lands.

Completed questionnaires were then checked for completeness and accuracy in readiness for analysis. Data noted through observation, consultations and searches were again systematically organised in preparation for use.

Table 2 shows the commercial nodes in which the survey was carried out. Areas like Commerce Park and Kgale Hill were excluded as they lie

outside the boundary of the City of Gaborone. These areas are fully developed with office buildings and industrial parks which are currently serving the Gaborone office market, but as far as city boundaries are concerned they are in the South East District Council whose headquarters is in Ramotswa.

The areas were also classified as Grade A (Prime office) and B (Secondary office) offices (cf. table 2). Grade A offices are modern buildings less than 10 years old but with all the necessary elements needed in a modern building. These are: air conditioning units; power, network, and telephone skirting; basement parking with fire sprinklers; adequate outside parking for workers and customers; close proximity to shopping centres; transport available and close to highways. Grade B offices are office buildings which were older than 10 years old but with all the elements that are available in Grade A office buildings.

Table 1 Responses to the questionnaire to landlords / tenants

1.	What is your occupation/line of business? (137)
2.	For how long have you been in these premises? (137)
3.	Why did you move from the previous premises? (137)
4.	Are you renting or you are the owner of the building? (a) Renting (100) (b) Owner (37)
5.	If owner what was your source of funds to build or buy this property? (a) Loan (22) (b) Savings (10) (c) Business (5)
6.	Who does your maintenance and repairs to your office buildings? (137)
7.	If renting, how much rent are you paying per month? (100)
8.	Do you have problems in paying rent? (100)
9.	How much area of office space are you renting? (100)
10.	Are you rent any parking? (a) Yes (77) (b) No (23)
11.	If yes, how much per parking per month? (77)
12.	What type of parking? (a) Basement (60) (b) covered carports (17) (c) Garage (0)
13.	Do these offices have air-conditioners, power/telephone/ network skirting? (a) Yes (100) (b) No (37)
14.	If owner, what are your views about renting your offices to government departments/ministries? (37)
15.	Do you have Government as your tenant in any of your buildings? (a) Yes (10) (b) No (27)
16.	How much space are they occupying and at what rent? (10) (a) Rent per month (b) Space occupied (c) Parking per bay and how many, if any
17.	If Government gave up your space today, what would you do with it, do you have any emergency plans? (10)
18.	Do you think Government's involvement in private office space is a major contributing factor to a boom? (a) Yes (100) (b) No (37)
19.	If yes, why (100)
20.	Do you have problems in collecting rent from your tenants (27)
21.	How much office space is rented to (a) Government (10) (b) Private business (27)

22.	Do you have any voids/vacant spaces in your building? (a) Yes (10)(b) No (27)
23.	If yes, how much in square metres? (10)
24.	How much was your capital investment on this building? (37)
25.	What is your monthly gross rental income? (37)
26.	What is your monthly operating expense? (37)
27.	Do you have any annual escalation clause in your leases? (a) Yes (105) (b) No.(32)
28.	If yes, what percentage? (105)
29.	What are prospects of the office accommodation marketing Gaborone? (137)
30.	What are the problems of the office accommodation market in Gaborone? (137)

Table 2 Distribution of office accommodation (Source: Gaborone City Council Valuation Rolland field survey)

	Location	Gross Lettable Area(m ²)	%	No. of questionnaires	Grade A (m2)	Grade B (m2)
1	The Main Mall	93 894.6	30.6	46	65 727	28 169
2	African Mall	12 936.3	4.2	6		12 936
3	Government Enclave	47 538.4	15.5	23	47 538	
4	Broadhurst Area	27 466.1	8.9	13	19 345	8 121
5	Extension 6	45 577.8	11.8	22	30 488	15 090
6	Bontleng Mall	2 778.6	0.9	1		2 779
7	Station Mall	3 041.2	1.0	2		3 041
8	Gaborone West	11 569.4	3.8	5		11 569
9	Molapo crossing mall	5 000.0	1.6	2(6)	5 000	
10	West gate mall	9 779.0	3.2	5(1)	9 779	
11	Show Ground Area	50 000.0	16.3	24	50 000	
Total		307 081.4	100	150	227 877	81 705
		100%			74%	26%

Table 3 shows the range of rentals charged in the market.

Table 3 Rentals charged in the market (Note: Pula [P] is the currency of Botswana)

Rental (P/m ²)	Average rental (P/m ²)	Percentage
25-40	32.5	57%
41-55	48.00	35%
56-88	72.00	7%
Total		100%

The mean was calculated to be 41.09P/m², with a standard deviation of 11.63., i.e. the number of firms paying rentals within the range P29.46 to P52.72 per square metre is 68%, and 95% of the rentals lie between P17.83 and P64.35/m²

Government as at 2005 rented 78 438.08m² at the cost of P44, 607, 972.68 in Gaborone only. The approximate size of office accommodation in

Gaborone is 307, 081.37m² excluding offices owned and occupied by Government. This above expenditure on government's side covers 68% of their annual budget and 32% in other areas outside Gaborone. In 2005 the overall office budget expenditure was P65 million. It is therefore evident that the majority of office space rented is in Gaborone. The government is renting about 25% of office space where as the remainder of 75% belongs to the private companies and parastatals. The trend of Gaborone office budget expenditure for the period 2000-2005 is illustrated in figure 3.

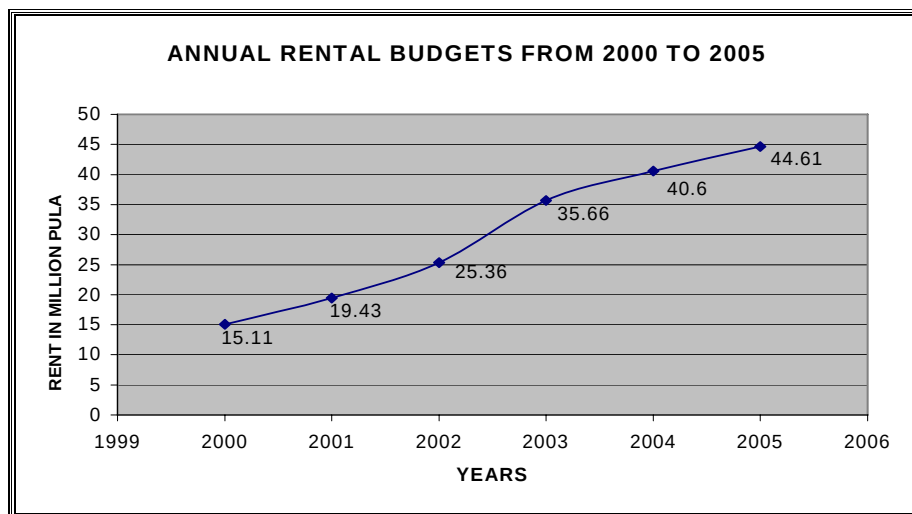


Figure 2 Government office rental budget for Gaborone 2000-2005 (Source: Field survey)

The major increase in the budget occurred in 2003 as a result of the formation of two new Ministries (the Ministry of Local Government and Ministry of Wildlife and Tourism).

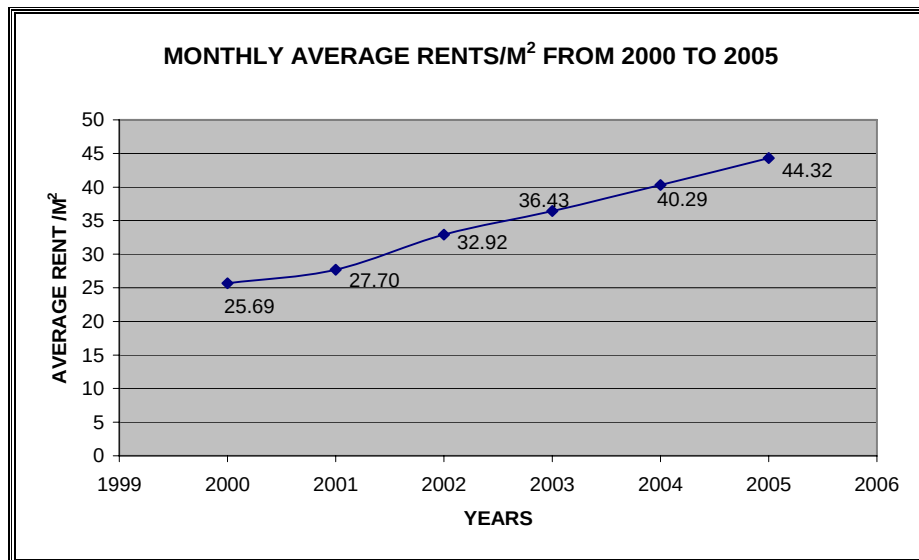


Figure 3 Monthly average rents /m² 2000 - 2005 (Source: Field survey)

Increases in average rentals escalated by between 8% and 10%, with the exception of an increase of nearly 19% in 2002 as a result of the additional space for the newly formed ministries.

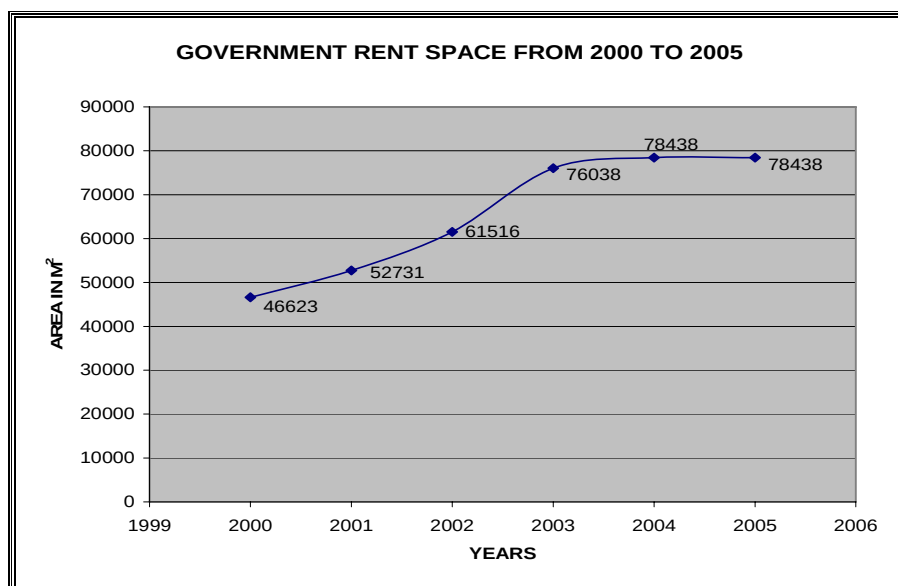


Figure 4 Total space rented by Government 2000-2005 (Source: Field survey)

In 2001 an additional area of 6108m² was taken from the market. In 2002 additional space of 8785m² was rented from the market. In 2003, 14522m² was rented from the property market of Gaborone. In 2004 only 2400m² was taken as additional rented space. In 2005 there was no additional space rented as shown in the above chart. This is attributed to financial constraints and unfavourable economic conditions in the national economy. Additional spaces obtained in the previous years were indicative of formation of new Departments and Ministries.

The above rented area / space in metre squared are plotted against the average monthly rentals charged per metre squared. It is observed that the space was increasing from 2001 up to 2004. There was no increase in space between 2004 and 2005. There is a very strong positive correlation ($R = 0.9537$) between space rented and average rental.

3. MAIN FINDINGS

- Government occupies about 25% of office space in the market while 67% is occupied by private business and the remainder occupied by the banks, insurance companies and parastatals. The government deficit cannot be eradicated or solved within a short period of time. It will take

time to solve this problem of lack of office space. It is also more costly to build than to rent that is why government decided to rent in the short term.

- The government in 2005 paid P44.61 million for office space in Gaborone. It also bought about 7500m² at a cost of P30.00 million during 2005 financial year. Government also built the Department of Taxes building of 15 000m² at cost of P110.00 million and the Ministry of Health building (25 000m²) at a cost of P160.00 million.
- Most of the private firms opted to operate from residential houses because they were reasonable in terms of rent demanded. Firms operating on a 100m² premises would pay around P2500.00 per month where as the same space in an area zoned for offices would cost about twice as much.

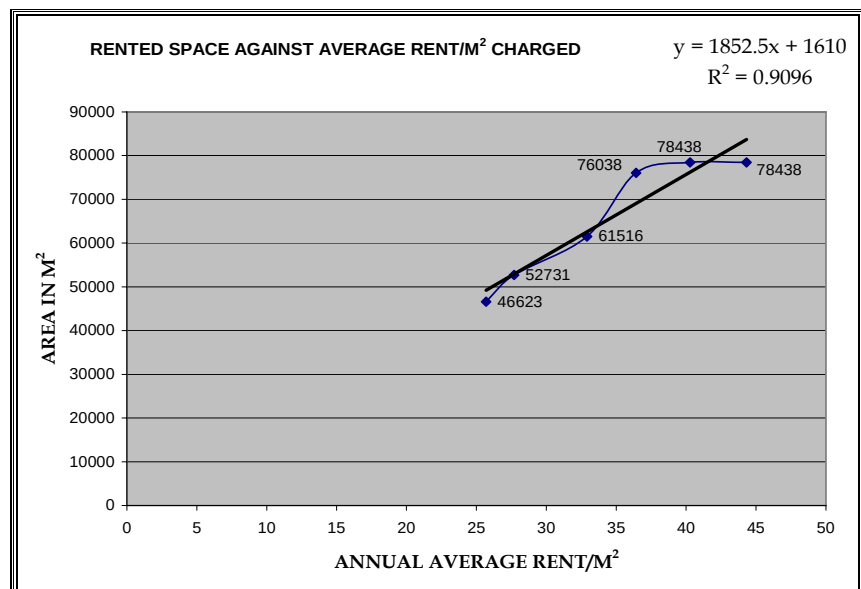


figure 5 Space rented by Government in m² against average monthly rentals / m² charged.
(Source: Field survey)

- Most of the companies that have developed new offices have at some stage offered their space to government for rent. As from 2004 the Government decided not to take up or acquire additional space but it would continue to pay for space already rented. With this situation at hand it will be difficult for property owners who had intentions to rent their premises to government. This is so because most owners just provide open plan space to government and then this is partitioned according to the space needs of the user department by government. This now will be

an additional cost to the developers / owners who need to partition before the offices are rented to the private firms with fewer employees. With multiple tenants in one building the cost of managing and service charges becomes a difficult task.

- Government involvement in office accommodation has induced the construction industry to construct more offices with a view of Government taking up the space. This is short lived, as government is no longer taking up new office space due to budget constraints.
- The relationship between government involvement and rise in rental prices is on 50 / 50 basis. The highest rental paid by government is P57.50 per metre squared where as the highest in the private sector is P88.00/m². The rise in rentals is influenced by occupational demand and the ability / willingness of the tenant to pay for the space. Mostly demand for office space is influenced by expansion of existing companies, vacation or change of offices and new companies coming into operation for the first time or those opening international branches.
- The price trend of office accommodation in Gaborone was generally stable for the period 2003-2005. The annual escalations were mostly around 10% or less.
- The market comprises tenants, owner-occupied and Government. About 92% of the office space is rented and 8% is owner occupied. Most of the owner-occupied offices belong to parastatals, Banks, Insurance companies, Building Society, Post office and some private companies.
- It was also evident that most of the parastatals bought or developed their office buildings through savings or grants from the government. Private developers and companies developed or bought through borrowed money from the banks.
- It is also evident that small companies keep on moving from one place to another in search of lower rents.
- 60% expressed desire to rent their buildings to government because of the assurance of the steady flow of income. As most of the properties are mortgaged, it is also an assurance that the property will service the loan without much difficult.
- The vacancy / void as at 2005 stood at 3.2% of the office space (cf. figure 6). The highest vacancy rate occurred in 2002, mainly due to new additional office space that came into the market as a result of redevelopments in the area around the Main Mall. From the above vacancy rates, it is clear that the market is performing well because the rates are minimal.
- The amount of space occupied by government is 78 438m² at a cost of P44.61 million in 2005. The reason why government is renting is because it cannot manage to build at once, as this call for huge amount of money. If government were to produce an equivalent space, it would cost about P600 million Pula to get rid of that deficit.

- From the study it was evident that the average lowest and highest rentals being charged in the market were P32.50 and P72.00/m². The above rates are prevailing market rents.
- It is apparent that rentals for offices in Gaborone were not as high as those in other countries like South Africa. In a few exceptional cases rentals higher than P88.30/m² occurred, but these were not considered to be market rentals. It can be concluded that rentals in Botswana were sustainable and affordable depending on the financial status of the company.

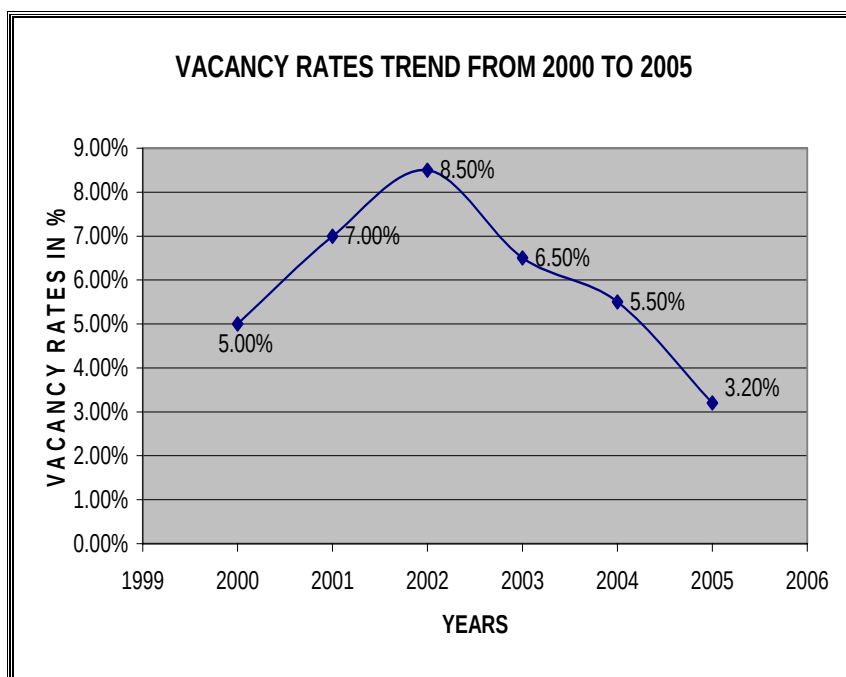


Figure 6 Vacancy rates trend from 2000 to 2005.(Field survey)

- Mushrooming offices around the Main Mall Area, Molapo, West Gate, Show Grounds, Commerce Park, Kgale Hill and the 10 000m² taken by BURS (Botswana Unified Revenue services) is evidence of government involvement in office accommodation which induced the rental market and the construction industry to construct more office buildings.
- Government purchased an office building of 7500m² in 2005 from Kgale Hill area for P30 million. This office was initially being rented by government and was later sold to government. This is a clear indication

that there is a relationship between government involvement and the rise in prices for office space.

- The price / rental trend of office accommodation in Gaborone is not static but keeps on increasing as was evidenced from the average rentals from 2000 to 2005.
- The current market rentals are relatively stable with annual escalations as evidenced from the average monthly rentals in the market from 2000 to 2005.

4. CONCLUSION AND RECOMMENDATION

There is a strong relationship between renting by government of office space and rising office rentals.

Recommendations to Government:

In order to have more information on property data there is need for government to establish bodies that will monitor the activities of the property market in Botswana.. It will be wise if government nominated a body like the Real Estate Institute of Botswana to compile and keep such data which could be useful for researchers as well as property practitioners in and outside Botswana. Property price indices should be set for all types of properties in Botswana as this will facilitate future analyses of the property market. Government should address the problem of shortage of land for office developments. Government has an obligation of making land available for development to its citizen.

Government should reconsider subdividing the new CBD into smaller manageable and affordable lots. It should also not restrict the sale of these lots to citizens but to whoever is capable and able to pay for the lots and eventually develop them according to the prescribed development covenants.

Government and councils should enforce the planning laws and development covenants as stated in the Title deeds. They should enforce the development control code Act because it caters for all different types of property.

It is also recommended that for the sake of encouraging foreign investment in Botswana, these commercial lots in the new CBD should be readvertised so as to invite foreign investors in the country. This issue of citizen empowerment is contributing to the failure of the economic prospects in the country. If the government still feels the new CBD should be developed by local citizens then it should split the area into two so that the other half could be given to foreign investors/ developers who are able and capable of paying for the plots and developing them.

Recommendations to the property industry

The property industry should liaise with the government on ways of training more qualified property practitioners as the success of the industry fully relies on skilled professionals.

Parastatals and companies with reasonable property portfolios should consider forming Estate Sections / Departments to enhance or increase the return for the property portfolio investment.

It is also recommended that banks should be able to accept valuations from any registered Valuers from private firms and not only from the executive members of the Institute. By doing so they will be promoting transparency in their dealings as purported by the Government Vision 2016.

Banks who are unable to finance office development projects should at least consider funding construction / bridging finance only during construction period. Upon completion, the developer can secure long term finance from National Development Bank.

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USING SERVICE QUALITY TO ENHANCE COMPETITIVE POSITIONNING OF LOCAL CONTRACTORS IN ZAMBIA

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ABSTRACT

Purpose

This paper examines service quality and its potential to enhance competitive advantage of local contractors in the Zambian Construction industry. The study acknowledges that local contracting companies and organisations face immense challenges due to changes in global and national environments. With the increase in foreign direct investment and foreign contractor/firms entrance in developing countries, local contractors are expected to provide better service quality in order to remain competitive. The authors argue that improving service quality would help local contractors to enhance their competitiveness in a globalised economy.

Design/Methodology/Approach

The findings in this paper are based on a case study of service quality levels provided by maintenance contractors in an international organisation in Zambia. An instrument based on the SERVQUAL approach was used to collect service quality data. The determination of service quality was based on the comparison between the expected and perceived service quality levels.

Findings

Generally the findings show that service quality expectations for the client are not met. It is generally acknowledged in literature that service quality is one of the leveraging factors for companies to create a competitive advantage over others and therefore the authors recommend that local contractors should improve their service quality levels if they are to remain competitive in a globalised economy.

Originality/Value

This research is part of large project focusing on the understanding of issues impacting on the development of the Zambian construction industry. This paper contributes to the understanding of key challenges facing local contractors in the Zambian construction industry. The paper also addresses the importance of service quality as a leveraging tool to enhance a firm's competitive advantage.

Key words: competitive advantage, globalisation, service quality, SERVQUAL, Zambia

1. INTRODUCTION

The changing environment in developing countries and specifically the impact of globalisation represents both threats and opportunities. Zambia like many Sub-Sahara African Countries has undergone significant transformations since the early 1990's. One of the significant changes has been the opening up of the markets from a controlled economy ^[1]. The control of economic markets and political influence is a major risk to foreign investors in many developing countries. The opening up of the economy in Zambia has meant that many foreign companies have seen this as an opportunity to invest in these former risky areas.

While there are still some risks in investing in developing countries, there seem to be a change in attitude by foreign investors towards developing countries that have opened up their markets through liberalisation policies. The construction industry has been seen as one of the entrance avenues by foreign investors into these developing economies due to the potential for growth as there is a huge market for capital projects ^[2]. However while foreign contractors/investors see this as an opportunity, local contractors are faced with competition from the foreign contractors who are able to offer cost advantages due to their well developed supply chains. In addition foreign contractors with their capital machinery are able to provide a quicker service than local contractors.

It is therefore important that the local contractors find a way of creating for themselves leverage against this competition so as to survive the growing competition. The authors acknowledge that improving the quality of service can be a good way to create competitive advantage for these companies.

It is generally acknowledged in literature that service quality can help companies leverage their competitive advantage^[3, 4, 5].

This study explores the potential for contractors to use service quality as a leveraging tool to create competitive advantage. Preliminary findings were reported in Zulu and Chileshe^[6] where the potential for service quality to enhance competitive advantage was considered. This paper is an extended version of the above paper.

The paper first discusses the changing landscape of the Zambian environment in general and also the construction industry in specific. Secondly service quality is discussed in light of its ability to create competitive advantage. The last section presents a case study of service quality levels in the Zambian construction industry. Based on the findings the authors provide their opinion of what contractors should do in order to survive the changing landscape.

2. CHANGES IN THE ZAMBIAN CONSTRUCTION INDUSTRY

The Zambian economic and political environment has seen significant changes since 1991 when it returned to multi-party democracy. One of the changes was the liberisation of the economy from a controlled economy to a free market state. This brought about increased competition from within the economy and entrance of foreign players into the economy [1]. The construction industry has not been immune to these changes as several foreign contractors have now successfully established themselves in the industry.

The construction industry plays a significant contribution to national economies. Zambia has seen a steady growth in its construction industry over the last ten years. Its contribution to GDP has grown from 3.5% in 1996 to 13.9% in 2006 [7, 8, 9]. Bosten [2] recognises that the construction industry is also seen as one of the important entry points for foreign investors as it is a profitable sector and important sector in emerging economies. Since 1991 the Zambian construction industry has seen a leap in the number of foreign companies.

With the liberalisation of the economy, the industry has continued to grow and has seen an increase in foreign company involvement in the industry. The increasing number of Chinese firms and general foreign direct investment pledges into the Zambian construction is an example of this change. Foreign direct investment increased from USD4,933,500 in 2005

to USD140,328,266 in 2006[10] while the number of Chinese construction companies has grown in the last ten years from about three to twenty [11]. The increased investment and numbers entering the industry from abroad seems to suggest that the industry has the potential to make profits.

It is suggested that many foreign contractors who enter the industry have a competitive advantage over local contractors. For example, Burke^[11] notes that Chinese contractors have an advantage over local companies in Zambia as they offer good quality at low cost. Burke^[11] argues that the cost difference could be as much as twenty percent (20%). Burke^[11] also suggests that these Chinese contractors are gaining popularity with both the public and private sectors for good quality and timely completion. It is generally agreed that Africa's quality performance in many areas lags behind best international practice^[12].

The Zambian construction industry is dominated by Small and Medium Enterprise (SME) contractors. An examination of the national construction council's register reveals that most of the registered contractors belong to the SME category^[13]. Albaladejo^[14] notes that SMEs constitute the future of an industry and an economy as a whole as it is expected that these companies will one day be in the largest category of the industry.

However with the current globalised economy they face major challenges. Beyene^[15] argued that with the increase in globalisation, Africa's SME's should be prepared to be active participants in the global economy. Although SME contractors participate only in the local Zambian economy, the economy itself attracts global attention, and therefore the local companies are participants in a globalised economy. Beyene^[15] also argues that most SMEs in Africa lack organisation and knowledge in modern management techniques compared to their foreign counterparts. The World Bank^[16] in their evaluation of a project in Zambia also found that one of the factors which impacted on local contractors was that they lacked equipment to undertake construction works. It is important therefore that local companies find solutions to these emerging threats.

It is against this background that solutions to the competitiveness of domestic contractors should be found. The authors suggest that enhancing service quality would help local contractors to create for themselves a competitive advantage against foreign entrants. Studies have shown that service quality can enhance the competitiveness of the firm^[17, 18].

3. SERVICE QUALITY AND COMPETITIVE ADVANTAGE

Service quality has been extensively studied over the past decade. There are different definitions of service quality. Zeithaml as cited in Caro and Garcia [19] defines service quality as the assessment of the overall experience or superiority of the service by the customer. Bitner and Hubert, also cited by Caro & Garcia [20] Service quality can also be defined as 'the consumers overall impression of the relative inferiority or superiority of the service'.

Both these definitions focus on the assessment of the level of service by the customer. The work of Parasuraman et al [21], suggest that service quality can be measured by the difference between a customer expectation and perception of the service received. Service quality has been mostly measured using the service quality gap theory where the difference between the customers expectation before the service encounter and the evaluation of the service encounter, provides the basis for assessment of service quality [3]. There are different methods for measuring service quality.

However one of the most used methods is the use of the service quality measurement model (SERVQUAL) developed by Parasuraman et al [21]. The model assesses service quality using five dimensions which include reliability, responsiveness, assurance, empathy and tangibles. Kim et al [4] also, despite criticism of the SERVQUAL instrument, support it as having superior diagnostic capacity than many other instruments. The SERVQUAL instrument has been used extensively and has also been adapted for industry or process specific studies. For example it has been used and adapted for the construction industry [22, 23, 24, 25, 26].

The impact of service quality on performance and customer satisfaction has been examined [27, 28, 29]. The service quality impact on fostering a firm's competitive advantage has also been examined [18, 17, 27]. Chrysoschoidis and Theoharakis [18] in analysing factors impacting on a firm's competitiveness concluded that service quality is an important factor for the attainment of competitive advantage.

Maclaran and McGowan [17] noted that smaller firms are very vulnerable to competition from larger firms as the large firms can easily create a cost advantage due to economies of scale. However they argue that small firms are better placed to create differentiation through service quality as, due to their size, they can personalise their service. Ropert and Wren [27] also noted that companies 'which are adept at service quality can build competitive positional advantage'.

Clow and Vorhies [3] suggest that service quality brings about among other things, increased competitive advantage, while Kim et al [4] recognises that service quality is considered as an essential strategic tool

for firms to create for themselves competitive advantage over their competitors.

Rahman ^[5] also stated that in order for firms to have sustainable competitive advantage, they have to put in place strategies that will help them retain customers and that one such strategy is the use of improved service quality. It is clear from the above discussion that service quality can be used as a tool to enhance competitive advantage.

4. THE CASE STUDY

The study used a case study approach to understand the service quality position of local contractors. The use of case studies provides a researcher with an opportunity to investigate an issue at a greater depth than many other methods.

One of the criticisms with case studies is that its results can lack empirical or statistical generalisation (Fellows and Liu 2003). Descombe (2003) however argues that careful considerations can be made to make it possible to make justification for generalisation of the case study findings. The authors acknowledge this potential limitation with the use of case studies.

This case study organisation is an international organisation based in Zambia. Although the company receives services from various organisations and companies, the focus of this research was on quality of building maintenance services as the organisation outsources all its maintenance services for its buildings portfolio. The organisation has a dedicated maintenance department which oversees and manages all maintenance contracts.

In order to assess service quality, the organisation's Estate Manager was asked to assess their expectation and perception of service quality based on the SERVQUAL instrument for maintenance contractors. The measurement items used were an adaptation of the instrument used in Hoxley ^[22]. Table 1 summarises the dimensions of service quality and their related measurement items included in the research instrument. The Estate Manager was asked to assess both the expected and perceived service quality levels for each of the items on a scale of 1 to 7, with 1 representing very low and 7 representing very high. A total of 10 contractors were assessed.

The determination of service quality was based on assessing the difference between service quality expectation and perception scores ^[31]. In order to calculate the differences, the aggregate scores in each dimension were computed by finding the mean score.

Table 1: Service quality dimensions

Dimension	
Tangibles	
(1)	Has up-to-date equipment
(2)	Has physical facilities that are visually appealing
(3)	Has employees who have a neat appearance
(4)	Is of an appropriate size in relation to the work performed
(5)	Have good site supervision of projects
(6)	Have a good standard of verbal and written presentation of work
Reliability	
(7)	Will do something by a certain time as promised
(8)	Show sincere interest in solving problems
(9)	Provides the service at the time promised
(10)	Perform the service right the first time
(11)	Are potential suitors for establishing long term working relationship
Responsiveness	
(12)	Tells clients exactly when services will be performed
(13)	Give prompt service to us
(14)	Respond to clients' requests
(15)	Are willing to help Clients
Assurance	
(16)	The behaviour of employees instil confidence in clients
(17)	Clients feel safe in their transactions
(18)	Employees consistently courteous with us
(19)	Employees have knowledge to answer enquiries
(20)	Experienced workers perform the work
Empathy	
(21)	Operate in hours convenient to us
(22)	Give clients individualized attention
(23)	Understand our specific needs
(24)	Understand the our organisation

5. DISCUSSION OF RESULTS

The data in Table 2 summarises the client's mean expectations and perception scores. The service quality scores for each dimension were determined by finding the mean score for all the measurement items under the dimensions. The first row, Client expectation, includes mean scores for the service quality level expected by the client. The perceived service quality levels for each contractor are recorded as C1 to C10. The data show that only 3 contractors (30%) equal or exceeded the client's expectation in all dimensions. As can be seen from the table, only contractors 8 to 10 had mean scores greater than the clients expected score in each of the service quality dimensions.

Table 2: 'Expected' vs. 'Perceived' Mean Scores

Dimension	Tangible	Reliability	Responsiveness	Assurance	Empathy	
Client expectation	6.00	5.80	6.25	5.60	6.00	
Client Perceived	C1	5.33	4.60	3.75	5.00	5.25
	C2	3.17	2.20	3.00	3.40	4.00
	C3	5.00	5.40	5.50	5.80	6.00
	C4	4.00	4.40	4.25	4.20	5.50
	C5	4.50	6.00	6.00	6.00	5.75
	C6	3.83	1.40	1.00	3.60	4.25
	C7	5.00	4.00	4.50	5.80	5.50
	C8	7.00	6.80	7.00	7.00	6.75
	C9	6.00	6.00	6.25	6.20	6.50
	C10	6.67	7.00	7.00	7.00	7.00

Table 3 shows the service quality scores for all the contractors. This was determined by subtracting the expectation score from the perception score. The interpretation of the results are that were a score is '0', then the contractor achieves the client's expectation, '<0' then the contractor fails to achieve the client's minimum and '>0' then the contractor exceeds client's minimum expectation of service quality. The scores in Table 3 also suggests that some of the contractors provide very poor service quality levels as their service quality scores are significantly below the clients expectation. See for example contractor 2 (C2) and contractor 6 (C6).

Table 3: Service Quality Score

Table 8: Service Quality Score						
Dimension		Tangible	Reliability	Responsiveness	Assurance	Empathy
Contractor SQ Score	C1	-0.67	-1.20	-2.50	-0.60	-0.75
	C2	-2.83	-3.60	-3.25	-2.20	-2.00
	C3	-1.00	-0.40	-0.75	0.20	0.00
	C4	-2.00	-1.40	-2.00	-1.40	-0.50
	C5	-1.50	0.20	-0.25	0.40	-0.25
	C6	-2.17	-4.40	-5.25	-2.00	-1.75
	C7	-1.00	-1.80	-1.75	0.20	-0.50
	C8	1.00	1.00	0.75	1.40	0.75
	C9	0.00	0.20	0.00	0.60	0.50
	C10	0.67	1.20	0.75	1.40	1.00
Aggregate SERVQUAL		-0.95	-1.02	-1.43	-0.20	-0.35

The aggregate service quality score in Table 3 suggests that overall the client does not receive the expected service quality as the aggregate service quality scores are all negative. The findings also suggest that generally contractors are less responsive to the client's needs, while they seem to provide some assurance to the client in respect of their ability to deliver.

Responsiveness refers to the willingness of contractors to help clients and provide prompt service. It is not surprising that this has achieved a lowest score as it is evident that the construction industry is prone to poor time performance. Responsiveness has a score of -1.43.

This is followed by reliability (-1.02), tangibles (-0.95), and Empathy (-0.35). However quality assurance (SQ score = -0.20) had the best aggregate service quality score, although this is below the expected service quality levels. The findings in Table 3 also show that only three out of ten contractors achieve the client's expectations as their service quality scores are all positive in all dimensions.

The findings above show that local contractors are in a disadvantaged position in light of the ever increasing competition from foreign contractors. As suggested earlier, it seems that foreign contractors have a cost and performance advantage over local contractors. In order to help local contractors create for themselves competitive advantage, they need to consider other ways such as increasing their service quality levels. Literature, as discussed earlier, shows that enhanced service quality can be used to create competitive positions.

The findings above therefore suggest that local contractors cannot compete favourably in many dimensions with foreign contractors. However, in order for the local contractors to be competitive, they need to consider enhancing their service quality levels, as this has the potential to leverage their competitive positions.

6. CONCLUSIONS

The paper set out to consider the viability of enhancing service quality as a tool to create competitive advantage. Literature review shows that organisations can improve their competitive advantage by using service quality as leverage.

The case study, although based on a relatively small sample of 10 contractors, provides an insight into service quality of building maintenance contractors in Zambia. The findings suggest that overall, based on aggregate scores, the contractors for this organisation provide lower than expected service quality to the organisation. The findings also show that

contractors can do more to improve their service quality especially in relation to the need to be more responsive to the clients needs.

In light of foreign competition who have cost advantages, the authors suggest that local contractors can use enhanced service quality to position themselves in a competitive position if they are to survive. However an examination of service quality in the case study organisation suggests that most local contractors fail to meet a client's expectations. It is therefore important that if contractors were to remain competitive, they need to acknowledge this failing and enhance their service quality to survive in a competitive environment.

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AN EXPLORATORY STUDY OF PROBLEMS FACING EMERGING CONTRACTORS IN THE NORTH WEST PROVINCE OF SOUTH AFRICA

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ABSTRACT

Purpose of this paper

The main purpose of this study was to examine the problems that are facing emerging contractors in South Africa focusing on the North West Province. Different studies have highlighted that there are different critical factors that influence the success or failure of contractors. They range from experience in the construction sector, technical and management skills, mentoring and access to finance. Since 1995 various contractor development programmes have been initiated in South Africa with little success.

Design/Methodology/Approach

A comprehensive literature study was conducted and it was supplemented by primary data gathering. A questionnaire was sent to over 100 contractors in the North West Province and 57 questionnaires were returned. The response rate was good as it was more than 50%.

Findings

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The main findings of the study was that the major problems contractors were found to be Government not paying on time, lack of capital and difficulty in arranging guarantees. Emerging contractors are failing due to lack of adequate capacity to handle the uniqueness, complexity and risks in contracting, lack of effective management during their early stages, lack of basic business management, poor record keeping and inadequate technical, financial and contract managerial skills.

Originality/Value of this paper

The importance of emerging contractors in South Africa has been recognised by many researchers. The contribution of these enterprises to the creation of jobs and to the alleviation of poverty has been recognized by many Developing World governments including the South African Governments. They have been given prominence in many development plans as well as in the strategies of many donors. The aim of the study was to examine the problems facing contractors in South Africa focusing on the North West Province. These will ensure that the programmes are relevant and effective.

Keywords: Emerging Contractors, Small and Medium Size, Emerging Contractor Development Programme, Enterprises.

1. INTRODUCTION

Micro and small enterprises are a major feature of the economic landscape in all developing countries today (Liedholm and Mead, 1999). The South African government has committed to ensuring that black-owned companies have access to the construction sector. Under its black economic empowerment (BEE) programme, the South African government has set targets for the percentage of each industry to be controlled by black-owned businesses. Large, predominately white-owned corporations have sold assets to achieve this objective, with the first sale occurring in late 2000. From 1995 the democratic government through its various departments has initiated some contractors' development programmes by which it awards certain levels of its construction projects to the historically disadvantaged black contractors in order to enable development of competent skills, build viable construction companies, create jobs and redistribute wealth (Department of Public Works (DPW), 1996).

A construction company's decision to expand into international markets must be based on a good understanding of the opportunities and threats associated with international business, as well as the development of company strengths relative to international activities (Luger, 1997). The study was done by surveying the executives in charge of international construction of large United States based contractors. The findings indicate that track record, specialist expertise and project management capability

are the most important company strengths; loss of key personnel, shortage of financial resources, and inflation and currency fluctuations are the most important threats relative to international markets; and increased long term profitability, the ability to maintain shareholders' returns, and the globalisation and openness of the markets are the most important opportunities available in international works (Luger, 1997). The vast majority of construction firms are small enterprises that rely on outsourcing personnel as required. According to the World Bank Survey (2001:44) of Small and Medium Size Enterprises (SMMEs) indicated that increased contracts from government and large companies were needed for them to expand their employment. This has severely affected skills training and the retention of expertise in the industry as construction workers become highly mobile, walking in and out of the industry, depending on performance in other sectors of the economy. The impact can be seen in the rigid adherence to management techniques and construction practices handed down from colonial times which have resulted in inadequate skills and capacity. Delays with interim and final payments, as well as onerous contract conditions faced by construction firms, can also impose huge constraints on the industry. Many construction firms have suffered financial ruin and bankruptcy because of delays in payment, which are common with government contracts (Croswell and McCutcheon, 2001).

2. RESEARCH OBJECTIVES

The main objective of this study was to establish the problems facing emerging contractors in the North West Province that leads to high failure rate. Another objective of the study was to find out on the gender and race composition of emerging contractors in the North West province. The majority of emerging contractors are owned and operated by men (Liedholm and Mead, 1999). It is imperative to find out how far is the transformation of the industry since 1994.

3. RESEARCH METHODOLOGY

One hundred (100) small and medium sized contractors were randomly selected from the database of the National Department of Public Works (NDPW), Mmabatho Regional Office: Emerging Contractors Development Programme; Local Municipalities: Contractors Development Programmes (CIP), and Construction Industry Development Board (CIDB) contractors register/database. The probability sampling method using simple random sampling was found to be the most appropriate for the study. The selection criteria adopted to form the target population included the following:

- Contractors from Grade 1 and 4 of the Construction Industry Development Board (CIDB) grading; and

- Emerging contractors located in North West province.

A total number of 100 questionnaires were distributed among small and medium sized contractors and 57 questionnaires were returned. The response rate was good as it was more than 50%. The research methodology for the study provided both primary and secondary data. The primary data collected formed the investigation using a structured questionnaire. The primary data was collected between June 2008 and September 2008. The scope of the study was delimited to small and medium size contractors operating in the North West province of South Africa. The Microsoft Word and Excel programmes were used to present the graphics. The statistical programme used for analyses and presentation of data in this paper is the Statistical Package for the Social Sciences (SPSS). This section consists of descriptive statistics which uses frequency tables and display charts to provide information on key demographic variables in the study.

4. LITERATURE REVIEW

Thwala and Mvubu, 2008, Dlungwana and Rwelamila, 2003; Crosswell and McCutcheon, 2001; have stated that contractors can be distinguished from each other by variables such as the size of annual turnover, capacity and capability. The challenges facing small and medium-sized contractors can be distinguished between those that affect small-scale contractors and those that affect medium-sized contractors. Some key features of small-scale contractors are that they are largely unregistered, operate in the informal sector of the economy and have very little formal business systems. The small-scale sector comprises the largest percentage of total contractors, although they employ very few permanent staff, usually less than ten employees. The conditions in developing countries present additional challenges, which include, amongst others, the lack of resources for training contractors, such as funds, poor construction procurement systems and lack of management capacity and resources to equip managers to operate their business enterprises effectively and efficiently.

5. CHALLENGES FACED BY EMERGING CONTRACTORS IN SOUTH AFRICA

The challenges faced by small and medium contractors can be distinguished between those that affect small-scale contractors and those that affect medium-sized contractors. Small and medium contractors are facing increased competition due to the long-term real decline in demand, and many contractors have responded by shedding labour. The larger

contractors have responded by moving into the international market. Small local contractors, in particular, are furthermore subject to volatilities due to the geographic distribution of construction and the peak workloads that characterise construction projects, which has further reduced their ability to build capacity. Emerging contractors are subject to the same market forces described above for small contractors. However, while emerging contractor development policies were intended for black economic empowerment, small government contracts have in fact been used as job creation opportunities.

Lack of effective management during their early stages is a major cause of business failure for small and medium sized contractors. Owners tend to manage their businesses themselves as a measure of reducing operational costs. Poor record keeping is also a cause for start up business failure. In most cases, this is not only due to the low priority attached by new and fresh entrepreneurs, but also a lack of basic business management skills. Most business people, therefore, end up losing track of their daily transactions and cannot account for their expenses and profits at the end of the month. During the early stages of some business start ups, owners were unable to separate their business and family/domestic situations. Business funds were put to personal use and thus used in settling domestic issues. This has a negative impact on profitability and sustainability. Some owners/managers employ family members simply because of kinship relations. In some cases, these have turned out to be undisciplined and ineffectual, a factor that has led to eventual and sometimes rapid failure of businesses (Rwelamila, 2002; Miles, 1980; Crosswell & McCutchen, 2001; Mphahlele, 2001; Ofori, 1991); International Labour Organization –ILO- (1987); Wijewardena, H. & Tibbis, G.E. (1999). The relative lack of success facing emerging contractors in South Africa was a result of: inadequate finance and inability to get credit from suppliers; inability to employ competent workers; poor pricing, tendering, and contract documentation skills; poor mentoring; fronting for established contractors; lack of entrepreneurial skills; lack of proper training; lack of resources for either large or complex construction work; lack of technical, financial, contractual, and managerial skills; and late payment for the work done.

Since 1995, the Department of Public Works (DPW) has been actively involved in conceptualising and implementing programmes to promote emerging contractors in the built environment. Through these programmes, the DPW has increased participation of previously disadvantaged individuals in the mainstream economy. Moreover, it increased economic activity in an economically depressed environment. Previous contractor development programmes have focused on the under R500 000 range, which has been found not to be a sustainable market given the number of new entrants to the market. This resulted in few of the contractors being sustainable and the cost of contractor development consequently being extremely high compared to the sustainable result.

The challenges faced by the emerging contractors include: the coordination and management of the many facets of the different programmes; maintaining focus on sustainability against pressures to roll-out too rapidly; reaching target market with information about the opportunity; sourcing mentors with the requisite skills and experience; the large numbers of contractors targeted requires large numbers of trainers and mentors which are not readily available, and are costly; the available resources to effectively and efficiently monitor, evaluate and facilitate programmes are limited; an integrated development approach requires considerable support from senior management of public sector clients and considerable inputs from officials; programmes lack sustainability; while public sector clients have done a lot for contractor development, particularly in the area of policy, there are still many issues that must be addressed at operational level, such as late payment cycles; procurement policies should encourage longer contract periods and move away from frequent tendering which is both expensive and disruptive; more qualifications need to be developed that are targeted at the specific needs of small and emerging contractors; there is a lack of access to affordable finance; emerging contractors lack demonstrable credit and track records. The following are the major constraints faced by emerging contractors' development and growth.

6. FINANCIAL BARRIERS TO SMALL AND MEDIUM CONTRACTORS' DEVELOPMENT AND GROWTH

Efforts to promote SMME access to finance might have more impact on development and growth but access is limited and the cost of capital is high. While government has made some efforts to increase accessibility to finances, the targeted programmes have had limited success because awareness and usage of existing promotional programmes is very low. In addition to insufficient access, high interest rates also pose a constraint to micro enterprise growth. Moreover, Gounden (2000) reports that there are core difficulties seen in terms of discrimination by financial institutions against micro enterprises with little collateral, difficulties in accessing information and lack of market exposure. The inadequacy of external finance at the critical growth/transformation stages of micro enterprises deters the enterprises with growth potential from expanding (Nissanke, 2001).

7. LEGAL BARRIERS TO SMALL AND MEDIUM SIZED CONTRACTORS' DEVELOPMENT AND GROWTH

With regard to legal barriers, a commonly perceived constraint of micro enterprises is the labour laws which are said to raise the cost of employment artificially prolong retrenchments or corrective action and do not allow for adequate flexibility especially in wage settings and the arrangement of working time (Bhorat, H; Lundall, P & Rospabe, S., 2002). As a result, enterprises feel a profit squeeze and impact on the willingness to create jobs.

8. FINDINGS FROM THE NORTH WEST STUDY

The pie chart below shows that the small and medium size industry in South Africa is still male dominated with 78% male and 22% female owned. The age of the people interviewed ranges from 20 to 59 years old. 98.3% of the people interviewed were Black and 1.7% percent were Coloured people. The figure clearly shows that emerging contractors in the North West Province are dominated by Black people. 71.2 % of the people interviewed were managing directors; 6.8% were managing partners; 8.5% were Construction Project Managers and 10.2% were Construction Managers.

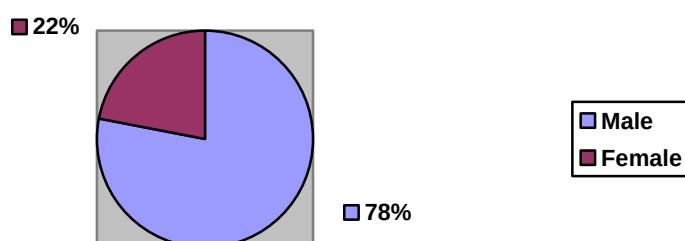


Figure 1: Gender in the North West Province

Table 1: A survey of Contractors' Qualifications, North West Province, 2008		
Qualification	Frequency	%
Grade 11 or lower	10	18
Grade 12	17	30
Post Matric Diploma/ Certificate	17	30

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Bachelor's Degree	6	10
Post-graduate Degree	7	12
Total	57	100

The results also show that 18% of the owners of the contractors had a Grade 11 or lower qualification; 30% had Grade 12 qualification; 30% had a post-Matric Diploma or Certificate; 10% had a Bachelor's degree and 12% had a post graduate degree. The results also show that 45.7% of the owners had a qualification that is up to Grade 12.

Table 2: Contractors' track record in North West province as at 2008

Table 2: Contractors' Track Record in North West Province as at 2008		
No. of Projects Managed	Frequency	%
0 - 2 projects	43	75
3 - 19 projects	11	19
11 - 15 projects	2	4
Above 20 projects	1	2
Total	57	100

The results show that 75% of the contractors manage between 0-2 projects; 19% of the contractors manage between 3-19 projects; 4% of the contractors manage between 11-15 projects and 2% of the contractors manage above 20 projects at a time. Most of the contractors at the lower grading lack the capacity to manage many projects at one time.

Table 3: Basic construction skills lacked by contractors, North West province, 2008

Table 3: Basic Construction Skills lacked by Contractors, North West Province, 2008		
Type of Construction Skills	Frequency	%
Construction Management	9	15
Business Management	11	20
Project Management	11	20

Health and Safety	6	10
Tendering	11	20
Site Management	9	15
Total	57	100

The results show that contractors lack basic construction skills with only 15% construction management; 20% business management; 20% project management; 10% health safety; 20% tendering and 15% site management. It is also clear that the majority of the contractors in the North West Province lack important skills that will enable their contractors to be successful. The results show that scarce skills in the construction industry is a main challenge, as most of the small and medium sized contractors cannot afford to hire qualified artisans and construction professionals due to the high demand of built environment professionals. And it leaves small and medium sized contractors with no option but to outsource their work to the well-established contractors.

Table 4: Contractors' years of experience, North West province, 2008

Table 4: Contractors' Years of Experience, North West Province, 2008		
Years of Experience	Frequency	%
less than 3 years	21	37
3 - 5 years	19	33.9
11 - 15 years	11	18.6
Over 15 years	6	10.5
Total	57	100

The research also found that 37% of the owners of the contractors have less than three years experience; 33.9% of the owners have between 3 and 5 years experience; 18.6 % of the owners have between 11 and 15 years and 10.5% have above 15 years experience in the construction sector.

9. CONCLUSION AND RECOMMENDATIONS

This paper has shown that after 15 years into the new democratic South Africa, the state of emerging contractors continues to be unsustainable,

even with existence of supportive programmes (i.e. contractor development programme and emerging contractor development programme). The South African construction industry will continue to provide jobs for Historically Disadvantaged Individuals (HDI) but without such an intervention, small and medium sized contractors will remain unsustainable and their performance unsatisfactory. The study finds that lack of effective management during their early stages is a major cause of business failure for small and medium sized contractors. Owners tend to manage their businesses themselves as a measure of reducing operational costs. Poor record keeping is also a cause for startup business failure. Lack of financial management; lack of entrepreneurial skills; lack of proper training; lack of resources; lack of technical skills, lack of contractual and managerial skills; late payment for work done which are common with government contracts; inability to get credit from suppliers and fronting for established contractors are also contributing factors for the failure of emerging contractors in the North West Province.

In order to address problems and challenges faced by emerging contractors in South Africa, it is critical for the government to review policies with regard to Contractor Development Programmes (CDP) to ensure that the government contributes to the success of small contractors in South Africa. The research had established that there is not one critical success factor that can make small and medium sized contractors to be successful but a combination of factors. In the North West Province case study it was found that some factors were critical and some were less critical. The authors recommend that the following factors to be considered as key to the success of emerging contractors in the North West Province:

- **Business skills:** Location of business premises is very important. Set specific targets for your business, carry out market research, employ qualified personnel and put them in position according to their skills. Know and understand existing skills needed and attend refresher courses on business management skills.
- **Management skills:** Financial management should be emphasized as well as networking with other people with similar businesses and keeping records of workers to help in evaluation of the performance.
- **Access to capital:** Merge with others that have similar businesses, negotiate favourable credit purchases from the supplier, source affordable loans from financial institutions and negotiate advance payments from the clients.
- **Good record keeping:** Financial records should be prioritised and a record of books of accounts on a daily, weekly, monthly and annual basis should be established.
- **Well managed Cash flow:** Prepare cash flow forecasts and budgets and prepare a cost-benefit analysis. Lease equipment and other financial assets to improve your cash flow, negotiate

outstanding loans through payment procedures and scale down operational costs.

- **Family/domestic situation:** Separate business activities and family obligations and look for alternatives sources of income to cater for the family's basic needs.

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FACTORS AFFECTING TEAM FORMATION AND PERFORMANCE IN THE TANZANIAN CONSTRUCTION SECTOR

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ABSTRACT

Purpose and objectives

This paper discusses factors hindering team formation and performance in the Tanzanian construction sector. There have been many problems associated with project team formation, which affects team and project performance at large. These problems have led to unfinished projects, time and cost overruns and at times inferior works.

Methodology

The paper used both primary and secondary data. 5 consultants were interviewed and 30 questionnaires distributed to different project key players. Criteria's used to select contractors were such that firms involved were class one contractors with experience exceeding 10 years and an annual turnover of Tanzania Shillings above 10 billion.

Findings

The study revealed that communication shortcomings among key players were the most serious influencing factor. Similarly, failure to set agreed project goals at the start of the project, slow supply of documentation by consultants and members operating on tight profit margins were seen as serious problems hindering team formation and performance in the Tanzanian construction industry.

Practical implication

This paper highlights factors hindering construction team formation and proposes that there must be a smooth operation of formal communication including opening of informal communication channels. Similarly, profit margins for all team members should be adopted.

KEYWORDS: Project, team formation, performance, construction sector

1. INTRODUCTION

Construction industry is one of the major tools and has an important role to play in the economy of any state. The crucial importance of it stems from three points; firstly its sheer size in terms of absolute value, share of Gross Domestic Product (GDP) and employment. Secondly, its nature as a producer of investment goods critical to economic growth and recovery, and finally the extent to which the government is the client for much of its outputs. According to the Ministry of Finance and Economic Affairs (2008) the contribution of the industry to GDP was 6.4% and 6.5% in 2006 and 2007 respectively. Similarly, the contribution of industry to Gross Fixed Capital formation (GFCF) during the same period was 52.5% and 50.2% (ibid.)

Since economic growth is related to the level and efficiency of capital formation, it is also directly or indirectly related to the capacity and productivity of the construction sector. Thus, national benefits that can be accrued from improving the effectiveness of construction operations can be very significant. An increase in the industry's productivity should raise the earnings of those working in it as well as improve the productivity of other sectors thereby raise the general standard of living. On the other hand poor team formation might lead to poor performance of the construction industry and can have detrimental effects to other sectors of the economy as well as negate human development. This is one of the major reasons why one should be concerned with quality, cost and time in construction projects. In every construction projects, there are three objectives namely quality, cost and time, which the team formation and performance can be addressed. Johns (1995) advocates that the more project participants contribute to team performance, the more likely that the project objectives will be met. So far management of construction projects has continued to be a nightmare. The government as the main investor in construction projects continues to worry about the ever-increasing costs of construction projects and at the same time faced with non-completion of such projects within time limits and to quality requirements.

A construction project brings together a group of participants from different organizations and with different backgrounds, each with their own objectives, to form a temporary team to achieve a common objective, the procurement of the project. The objectives of the individual participant are important and can often take precedence over project goals unless they are managed well by the project team. Problems with teamwork within the project team are mainly caused by dissimilar objectives, motivations and perspectives held by the team members (Franks, 1995). The promotion of

self-interests and the lack of concern for other participant's risk on the project are important contributors to team failings (Gabriel, 1991). In a project-based industry, participant's behaviors are strongly influenced by the realization of the limited life span of each job and each project team and reflect "the uncooperative differentiated nature of the temporary organization and the divisions and general lack of collective responsibility for problems when they arise" (ibid.)

Goal setting appears to be an underlying requirement for team to work well and productively. Reijniers (1994) found a common cause of a team failure in the lack of goal-oriented preparation of teams. Common goals need to be set for team made up of individuals who bring with them different motives before these team member are able to work concurrently (Swierczek, 1994). Clients have a major role to play in setting these objectives for the team. The objectives however need to be realistic and perceived to be achievable otherwise their motivation will be lost. Ward, et al. (1991) and Williams and Lilley (1993) observe that the teams worked well when their members believed that they were individually benefiting or likely to benefit in the future.

The elimination of individual motives in a construction project will not be possible when the team members come from different organizations and only participate in the project team in a temporary organization. The values and culture of the parent organization cannot be replaced by those of the temporary venture. The understanding and accommodation of individual motives therefore paves the way for teams to improve their performance and be highly productive. Franks (1995) supports the view that this understanding is the first step towards achieving better teams in the construction industry. He proposes that the key to team development is to study character (of the individual) and then work at the perusal of relations of the group. The inadequate understanding of the individual within the team has been found by Reijniers (1994) to be a significant cause of disappointment when the "participants" characteristic are not considered adequately in advance in the preparation of the project organization".

1.2 The Existing Situation in Tanzania

In Tanzanian construction projects like other countries, the condition of contract has been used to define terms, which shows every ones responsibilities on what to be done. It indicates what to be done by the project manager, architect, engineer, quantity surveyor, contractor, and the client. The team formation practice in Tanzania is mainly by the client who approaches a project manager, an architect, quantity surveyor or engineer. Then the one approached, will assist the client to select other consultants e.g. an engineer or a quantity surveyor. The procurement Act (2004) stipulates how nomination / appointment of consultants should be done for public works. Mostly, part of a team is formed before tendering for consultancy service. Key few members are added after being selected.

This may eliminate most of the teamwork problems, as the team members would have worked together in previous works.

Another approach is by the client selecting consultants through tendering procedure or nomination. The client who is the owner and the financier of the project would normally approach a consultant for the design of the intended structure be it a building, a road or an airport. The consultants and the client will enter into a contract for the execution of the works starting from the design, preparation of tender documents, inviting and evaluation of tenders. Tenders will be evaluated and the successful contractor will enter into a contract with the client for carrying out the construction of the works to completion. The lead consultant will supervise the construction of the project to completion.

2. METHODOLOGY

2.1 Sampling procedure

In selecting the sample size a number of factors need to be considered, such as confidence in data, margin of error to be tolerated, type of analysis to be undertaken and population size. It is a general rule to have as large sample as possible to reduce the possibility of error and to generalize to population. Factors used to select the sample size for contractors are: the company must be registered in class one, the company must have experience over 10 years, must have an annual turnover above 10 billion Tanzanian shillings. Similarly for consultants are: the firm must be registered, have supervised different class of contractors in more than five projects, at least one project for each contractor. The company should have more than 10 years of experience in the construction industry.

2.2 Research methods

To obtain data for this study, questionnaires were distributed to contractors' office and sites, quantity surveying and architectural firms, clients, and other stakeholders were visited. Semi – structured interviews were conducted and consultations were done with different practitioners in the construction sector. A total of 30 questionnaires were distributed to consultants, contractors and clients. Ten (10) were distributed to Consultants, ten (10) to contractors and ten (10) to clients. Out of 30 questionnaires only 25 responded and the other five did not respond at all.

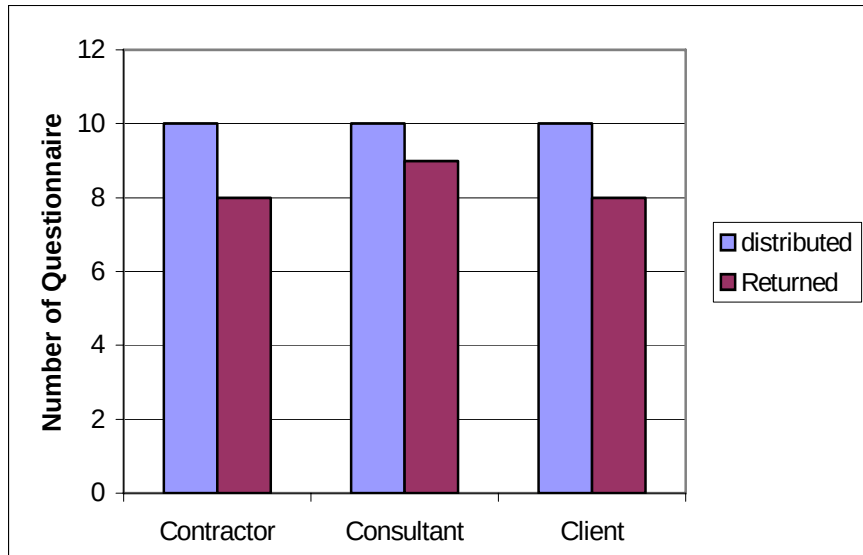


Figure 2.1 Distributed Questionnaires versus returned

3. FINDINGS AND DISCUSSION

An effective team is the one that accepts the strengths and weaknesses of its members and seeks to capitalize on each member's strengths. It takes ownership of the project and sees that each member's ideas are incorporated into the design process. Members realize that everyone's contributions to the project are important. Even though team members will perform different tasks during the project, all tasks contribute effectively to the end goal. A well-formed and highly committed team is critical to the success of the building and development of projects. Effective team building involves creating relationships among peers with a wide diversity of expertise. It takes time, energy, commitment, hard work but generally results in high performance, morals, and productivity. It is true that the interaction and interrelationships between team participants largely determine the overall performance of a construction project, their performance is interdependent, and hence in order to perform effectively, a reciprocal requirement exists, where by each participant requires the other to perform their duties effectively and in harmony with others. In the context of the project team formation, the performance will depend much on the team formed. Factors hindering team formation and performance are ranked in Table 3.1 below.

Table 3.1 Factors hindering team formation and performance as perceived by contractors

Factor	Contractors' ranking								Total	Rank
	1	2	3	4	5	6	7	8		
Communication shortcomings between members	3	4	5	3	8	1	3	4	31	1
Slow supply of documentation by consultants i.e. drawings	8	2	10	2	4	3	7	3	37	2
Failure to set agreed project goals at the start of the project	1	10	1	5	5	9	6	2	39	3
Unfair contract conditions	7	7	2	7	1	2	8	6	40	4
Unrealistic deadlines being set by team leaders	10	3	7	4	7	6	2	1	40	5
Errors in documentation and drawings by consultants	5	1	9	6	6	4	5	5	41	6
Slow resolution of disputes and conflicts	4	5	3	9	3	7	4	9	44	7
Selection of contractor who have tendered very low	6	9	4	3	2	5	10	7	46	8
Members operating on tight profit margins	2	8	6	10	9	8	1	8	52	9
Consultant held in low esteem by contractor	9	6	8	8	10	10	10	10	71	10

A list of 10 factors hindering team formation were identified and compiled from review of relevant literature. A 10 point scale was established 1 being the most serious and 10 the least. The factors were ranked in order of their seriousness, if the factor is given number one then it is the most serious and frequency factor amongst all. The factors that have low total score are the ones that are considered to be more serious than others. Contractors

ranked communication shortcomings as the first factor as it has significant impact on the execution of the project. If this happens, the flow of important documents from consultant to contractor and vice versa takes place at a slow rate, which in turn impacts the smooth operation of the project. The contractor has to wait for sometime before receiving clarification from the consultant. Slow supply of documentation by consultants was also identified by the contractors as one of the problem hindering their performance. Contractors would not execute any work before receiving the necessary details / instructions from consultants. If delay is experienced the whole of the work is also delayed.

Failure to set agreed project goals at the start of the project is another serious factor as ranked by contractors. When project goals are not defined at the beginning of the project participants will have their own objectives. If no common project objective established then individual objectives will get more weight, which may later result in poor performance. Unfair contract conditions, unrealistic deadlines' being set by team leaders have also been seen as the serious factors affecting contractors operating with very tight conditions. Errors in documentation and drawings by consultants emerged as one of the problems. Normally consultants will pay professional indemnity to cover mistakes or errors done by consultants. This might not be enough because during the course of production, contractor may get stuck and the project may stop for some days before it can resume. This may increase the project cost and also affect the performance of the project. Slow resolution of disputes and conflicts was also seen as a problem. There is a level of disputes and conflicts if reached no work will take place in any organization. Conflicts and disputes should be resolved quickly otherwise they can even frustrate the whole project.

Table 3.2 Factors hindering team formation and performance as perceived by consultants

Factors	Consultants' ranking									Total	Rank
	1	2	3	4	5	6	7	8	9		
Members operating on tight profit margins	3	10	8	4	1	2	1	2	8	39	1
Communication shortcomings between members	2	6	4	3	4	6	7	5	5	42	2
Selection of contractor who have tendered very low	6	8	1	8	7	7	2	3	2	44	3
Slow resolution of disputes and conflicts	9	7	7	6	9	1	5	1	1	46	4
Slow supply of documentation by consultants i.e. drawings	1	4	6	8	5	10	6	4	6	50	5
Contractors low regard for design issues	4	1	3	10	10	9	4	7	3	51	6
Inexperienced or unsophisticated clients	3	6	2	7	8	8	3	9	4	51	7
Errors in documentation and drawings by consultants	5	5	10	5	6	4	8	6	9	58	8
Differing perceptions of quality requirements expected	8	3	9	1	6	5	9	10	7	58	9
Unrealistic deadlines being set by team leaders	10	9	5	9	2	3	10	8	10	66	10

Consultants ranked members operating on tight profit margins to be the most serious factor hindering team formation and performance. There have been a lot of complaints from consultants that they are working at very tight profit margins since they are paid below what is provided in regulations governing their services. Under regulatory requirements there are specific fees to be paid to consultants for specific works. Yet still, consultants are getting paid below that level. This situation has resulted to consultants deploying team members with less experience as the most experienced and qualified workers demand high salary. Financiers of the project should pay reasonably so that the best team may be formed.

Communications shortcomings between members were ranked as another important factor. Good communication within the project team is an important ingredient of successful team performance and vice versa. Communication related problems hinder the performance of the team working on a specific project. Consultant's primary role is to maintain control of the project in terms of the budget, time-schedule and quality and this is largely achieved through communication between the project participants. The expeditious resolution of disputes and conflict is hindered by poor communications and this impact most greatly on contractors whose construction programs are typically tight, and on consultants who are responsible for the resolution of the disputes and conflicts. Communication should be very effective as poor communication between teams can cause considerable effect on the progress of work, which can frustrate the whole project. In order for the project to proceed smoothly and be brought to satisfactory completion, the channels of communication between parties should be established and understood by all team members.

Unrealistic deadlines' being set by team leaders was ranked as a least factor. This implies that the consultants are satisfied by most of deadlines set for completion of projects. Lastly differing perceptions of the quality requirements expected, errors in documentation and drawings were not seen as major problems to consultant in this study. The reason could probably be that consultants are the ones who in most cases are responsible for quality control and production of project drawings. If the project performs badly in terms of quality they are the ones to be blamed.

Table 3.3 Factors hindering team formation and performance as perceived by clients

Factor	Clients' ranking								Total	Rank
	1	2	3	4	5	6	7	8		
Communication shortcomings between members	1	5	1	2	1	1	8	3	22	1
Consultant held in low esteem by contractor	8	2	3	3	5	8	3	9	41	2
Failure to set detailed milestone objectives for the team	2	7	8	6	2	4	6	7	42	3
Unrealistic deadlines being set by team leaders	5	3	9	10	7	3	4	2	43	4
Failure to set agreed project goals at the start of the project	3	6	5	9	3	5	7	6	44	5
Slow supply of documentation by consultants i.e. drawings	9	10	2	7	4	2	2	8	44	6
Contractors low regard for design issues	10	1	7	5	10	9	1	1	44	7
Errors in documentation and drawings by consultants	4	4	4	4	9	7	9	5	46	8
Selection of contractor who have tendered very low	6	8	6	1	8	10	5	10	54	9
Members operating on tight profit margins	7	9	10	8	6	6	10	4	60	10

The most serious problems perceived by clients were communication shortcomings between project team members, failure to set detailed milestone objectives for the team and consultants held in low esteem by contractor. Good communication within the project team is an important ingredient of successful team performance. The detailed milestone

objectives of the project should be known at the beginning. If there are no detailed milestones objectives for the team then performance will be poor as members will not fulfill their obligation at the right time. The failure to set detailed milestones objectives is actually caused by communication shortcomings between the team at the beginning of the project. Unrealistic deadlines being set by team leaders, was seen as a problem by this groups of respondents. The reason could have been that in most cases consultants propose to the client the contract period, which later becomes unrealistic. This creates disturbance and add unnecessary costs to the client.

4. CONCLUSION

The current environment of team formation has a great influence on the performance of teams and the construction projects at large. Problems hindering team formation and performance differ from one group of respondents to the other. With contractors' group communication shortcomings between members was found to be the most serious followed by slow supply of documentation by consultants (drawings etc). Where as the consultants' group, members operating on tight profit margins was the most serious factor followed by communication shortcomings between members. Furthermore, with the clients' group, communication shortcomings between members was ranked as the most serious followed by failure to set detailed milestone objectives for the team. Comparing the frequency across the three groups, communication shortcomings between members is the most serious hindering factor in construction project team formation and performance. Lee et. al (2000) discloses that recently several researches have promoted the need to improve communication to eliminate the major cultural, behavioural, organizational and institutional barriers that currently exist between project participants. These serious problems need solutions and the solutions are found in the combination of competitive and co-operative competencies.

5. RECOMENDATIONS

Construction stakeholders are aware of the advantages that can be obtained from good and well selected team. They are also aware of the consequences if team members' selection is not done properly. The important question to be solved here is "what should be done so as to have successful teaming which will enhance performance, and end the notion that foreign firms perform better than local firms. To enhance that, mutually agreed goals should be established early in the project, realistic profit margins for all team members should be adopted and there must be a smooth operation of formal communication. Likewise informal

communication channels need to be opened to curb bureaucratic problems which are deep rooted.

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THE STATE OF CONTRACTOR DEVELOPMENT; SELECTED FACTS AND FINDINGS

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ABSTRACT

Purpose of this paper

To provide a qualitative and quantitative overview of the state of contractor development in the General Building and Civil Engineering sectors in South Africa, aimed as an input to developing targeting strategies for contractor development.

Design/methodology/approach

The research draws on a detailed analysis of upgrading and new contractor registrations obtained from the Construction Industry Development Board (cidb) Register of Contractors.

Findings

An analysis of the data shows that:

- the number of contractor's upgrading per year is relatively small, typically around 6% per year;
- contractor upgrading is typically a sustained process over a period of several years – depending on growth in financial capability of the contractor and experience with increasing contract size;
- the total number of new registrations is between 15% and 22% per year, which confirms the low entry barriers into the industry;
- the highest number of new registrations occurs in Grades 2 to 4, suggesting that this sector is becoming increasingly more competitive –

which could impact negatively on work opportunities for those contractors who are best able to succeed.

Research limitations/implications

The primary measure of contractor development used in the paper is that of an increase in the cidb contractor grade – which is based on increase in financial capability and largest contract completed. This measure however does not include an assessment in the development of skills, experience or competence of the contractor.

Practical implications

The assessment is being used as input into developing targeting strategies for contractor development, but also reinforces the need for developing competence assessment techniques by the cidb.

Value of paper

The assessment provides:

- an understanding the state and dynamics of contractor development;
- the basis of developing targeting strategies for contractor development; and
- a framework for further refining the concept and understanding of contractor development.

Keywords: Contractor Development Programmes, Register of Contractors, Upgrading, New Registrations, Targeting Strategies.

1. BACKGROUND AND INTRODUCTION

The South African Construction Industry Development Board (cidb) was appointed in April 2001 to direct and implement a comprehensive construction industry development strategy. The core objectives and functions of the Board are defined in the cidb Act (Act 38 of 2000) and the establishment of the Board constitutes a strategic partnership between the public and the private sectors.

The mandate of the cidb is, amongst others, to promote sustainable growth of the construction industry and the participation of the emerging sector in the industry, and in support of this the cidb has developed a range of instruments and programmes in partnership with key stakeholders that will drive convergence in development focus by the industry and its clients, including:

- the Register of Contractors to drive improved supply side performance;
- the Register of Projects to drive improved performance of clients; and
- the National Contractor Development Programme (NCDP).

Specifically, the National Contractor Development Programme (NCDP) is a sector-specific intervention that is geared to address enhancing capacity

and equity ownership across the different contracting categories and grades, as well as improved skills and performance in the delivery of capital works and maintenance across the public sector.

In order to make informed decisions within the NCDP, an understanding of the state of contractor development is required – and the cidb's Quarterly Monitor, Construction Industry Indicators (CIIs) and SME Business Condition Quarterly Survey are providing a wealth of information that can be used to inform procurement strategies and to direct development interventions such as the Contractor Development Programmes (CDPs).

However, notwithstanding this, there are also limitations to the current available information and understanding of contractor development, and the paper presents an assessment of the structure and dynamics of contractor development in South Africa as input into developing a deeper understanding of development.

2. STRUCTURE OF THE INDUSTRY

A previous paper by Milford et al (2007) produced an overview of the structure of the South African construction Industry, and it is instructive to repeat some of the core findings here.

Typical characteristics of contracting enterprises per cidb grade are given in Table 1, while typical General Building (GB) and Civil Engineering (CE) works projects undertaken by these enterprises is given in Table 2. (Note that Grade 1 contractors are not considered in the present investigation.)

Table 1. Characteristics of contracting enterprises

Grade	Max Tender Value	Characteristics		
		Turnover	Ownership	Presence
9	Unlimited	R1b pa plus	Public company, multinational	National / international
8	R100m	R100m to R1b	Public company	National / Regional
7	R30m	R20m to R100m	Public or private company / closed corporation	Largely Regional
6	R10m	R10m to R100m		
5	R5m	R2m to R30m	Private company / closed corporation / sole trader	Provincial / Local
4	R3m	R1m to R30m		
3	R1,5m	R0,5m to R10m	Closed corporation / sole trader (family business)	Local
2	R0,5m	R0,2m to R10m		

Note: Maximum tender values applicable end-2008

Table 2. Typical works projects per grade

Grade	Max Tender Value	Typical GB Project	Typical CE Project
9	Unlimited	• Unlimited	• Unlimited
8	R100m	• Construction of office blocks, schools, hospitals, prisons, etc • Housing developments	• Roads, bridges, silos • Water and sanitation reticulation • Harbour works
7	R30m	• Repair and renovations of buildings • Construction of community health centre, clinics • Extensions to buildings	• Rehabilitation and maintenance of roads and railway tracks • Roads and stormwater • Water and sanitation reticulation
6	R10m	• Construction of 10 to 16 classrooms • Construction of toilet block	
5	R5m	• Repair, renovations and extensions • Construction of community health centre, clinics, administration centers, 6 to 16 classrooms, etc	• Rehabilitation and remedial works • Roads and stormwater • Water supply and sanitation
4	R3m		
3	R1,5m	• Repair and renovations • Construction of 2 to 6 classrooms, toilet facilities	• Rehabilitation and remedial works • Fencing and walling • Minor roads and stormwater
2	R0,5m	• Walling, flooring and paving	

For later use, the requirements for registration in a particular grade depend on a contractor's financial capability and track record, and the requirements (as of end-2008) are given in Table 3 below.

Table 3. Financial capability requirements

Grade	Largest Contract Value	Average Annual Turnover	Largest Contract Completed During the last 5 years	Employable Capital
9	No limit	R210m	R80m	R54m
8	R100m	R70m	R26m	R18m
7	R30m	R18m	R8,0	R4,5m
6	R10m	R6,0m	R3,0	R1,5m
5	R5,0m	R2,5m	R1,6m	R0,5m
4	R3,0m	R1,5m	R0,8m	R0,3m
3	R1,5m	R0,75m	R0,26m	R0,15
2	R0,5m	na	R0,80m	R0,05

The number of active registered contractors (as of January 2009) in the General Building or Civil Engineering Classes of Works is shown in Table 4 and Figure 1. For later comparison, the contractors have been grouped into representative "bands". (Note that many contractors are registered in both Classes of Works.) It is seen that about 80% of the number of registered contractors in the General Building works category (excluding Grades 1) are in Grades 2 to 4 (typically contractors with a regional, provincial or local presence), and a further 15% in Grades 5 and 6 – which shows the dominance of SMEs in the industry. In Civil Engineering, about 70% of the contractors are registered in Grades 2 to 4, and a further 20% in Grades 5 and 6. Many of these contractors are largely dependent on work opportunities through subcontracting.

Table 4. Number of Registered Contractors; General Building and Civil Engineering

Grade	GB		CE	
	Number	%	Number	%
9	31	1%	56	1%
7 & 8	242	5%	304	7%
5 & 6	779	15%	982	22%
2 to 4	4 266	80%	3 040	69%
Total	5 318	100%	4 382	100%

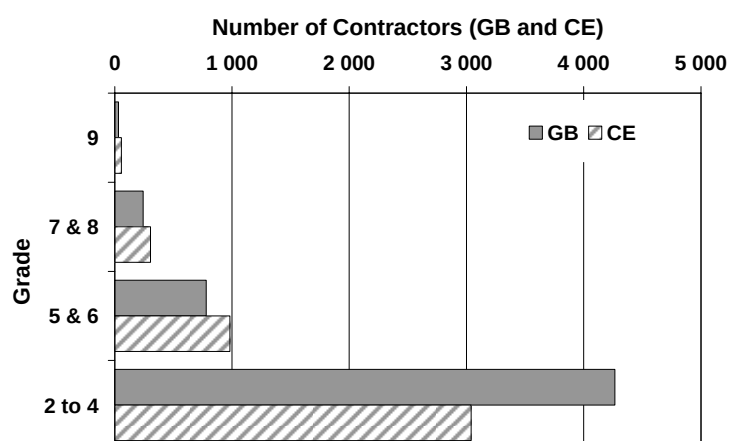


Figure 1. Number of registered contractors; General Building and Civil Engineering

3. CONTRACTOR DEVELOPMENT

This paper uses growth in a contractor's cidb grading as a proxy for development. However, it is recognised that contractor development as measured by the growth in a contractor's cidb contractor grade is only one component of development. In addition to a growth in competence reflected through technical skills and construction experience, equally

important is the 'process maturity' within a contracting organisation – normally expressed in terms of its business and construction processes.

Specifically, the Capability Maturity Model (CMM) describes the various stages of process maturity within an organisation in terms of the ability of the organisation to master its business and construction processes. The model notes that little value is added to an organisation by addressing issues at a higher level if all the key processes at the current level have not been satisfied (Finnemore et al, 2000).

The various stages within the CMM can be summarised as:

- Level 1: Initial; The processes are characterised as ad hoc, and occasionally even chaotic. Few processes are defined, and success depends on isolated effort.
- Level 2: Repeatable; Basic project management processes are established and repeatable. The necessary process discipline is in place to repeat successes on previous projects.
- Level 3: Defined; The processes for all activities are documented, standardised, and integrated into the organisation. All projects use an approved, tailored version of the contractor's standard process.
- Level 4: Managed; Detailed measures of the processes and product quality are collected. Both the processes and products are quantitatively understood and controlled.
- Level 5: Optimising; Continuous process improvement is enabled by using feedback from the processes to pilot innovative ideas and technologies. Contractors are consciously aware of their supply chain and get involved in the supply chain development.

It must be noted that all construction companies can mature over time – even if they remain at the same grade. Specifically, as organizations grow from one grade to a higher grade, their processes have to be adapted, grow and mature for their new level of capability.

3.1 Contractor Upgrades

The number of contractor upgrades during 2008 in General Building and Civil Engineering is shown in Table 5 and summarised in Figure 2. It is seen that on average around 6% of contractors are upgrading to higher grades per year. In General Building, the highest number of upgrades is occurring in Grades 5 and 6 – namely around 8% per year.

Table 5. Contractor upgrades in 2008; General Building and Civil Engineering

From Grade	GB			CE		
	Number of Contractors	Number of Upgrades	%	Number of Contractors	Number of Upgrades	%
9	31	na		56	na	
7 & 8	242	7	3%	304	8	3%
5 & 6	779	66	8%	982	63	6%
2 to 4	4 266	227	5%	3 040	198	7%
Total	5 318	300	6%	4 382	269	6%

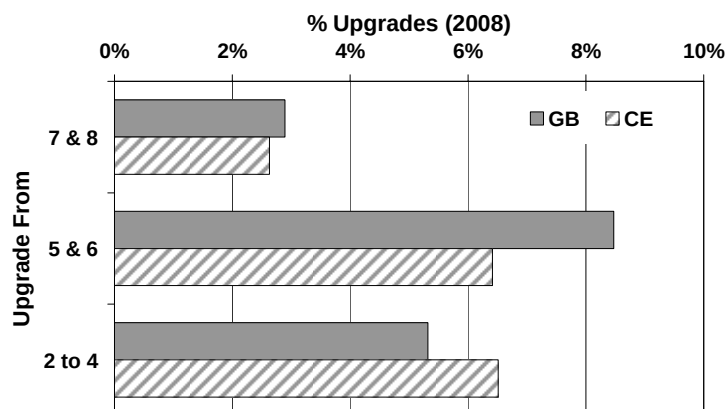


Figure 2. % Contractor Upgrades (2008)

A more detailed analysis is given in Table 6, which shows the breadth of upgrading that took place in 2008. In general, contractors would upgrade one or two grades per year, while in a few cases contractors would upgrade by several grades. Many of the latter are however associated with diversification of class of works (i.e. from General Building to Civil Engineering or vice versa) in which a contractor would receive an initial Grade 2 grading because the enterprise does not have a track record in that class of works.

Table 6. Contractor upgrades in 2008; General Building and Civil Engineering

From Grade	GB				CE			
	To Grade				To Grade			
	2 & 4	5 & 6	7 & 8	9	2 & 4	5 & 6	7 & 8	9
7 & 8			2%	1%			2%	1%
5 & 6		4%	5%			3%	3%	0,2%
2 & 4	3%	2%	0,1%		4%	3%	0,1%	

Further details on upgrading is given in Table 7 in which an upgrading time history is given for various contractors – from which it is seen that contractor upgrading typically follows a robust incremental development path over a period of several years.

Table 7. Upgrading time history

CoW	2006				2007				2008			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
GB	7		8							9		
CE					7			8				9
GB			4		6	8						
GB				5				6				8
GB						6					7	8
GB					6		7					8
GB					3	4		6				7
GB		4		5				7				
GB	4		6				7					
GB		4	5		6			7				

In addition, some contractors have shown significant growth in largest contract value undertaken (LCV) and annual turnover (ATO) as illustrated in Table 8 below, in which some contractors have increased their turnover 10- or 20-fold in a year or so. These are however the exception rather than the rule, and the sustainability of these enterprises are not yet known.

Table 8. Growth in Largest Contract Value and Annual Turnover

CoW	yyyyqq	Grade	LCV (Rm)	ATO (Rm)
GB	200701	3	1.5	1.1
GB	200702	4	1.8	3.2
GB	200803	7	11.0	25.7
CE	200604	3	1.9	1.0
CE	200604	4	5.5	12.0
CE	200701	6	5.5	12.0
CE	200703	7	8.2	37.8
GB	200701	3	0.6	1.5
GB	200702	4	1.3	8.0
GB	200704	6	3.6	10.0
GB	200804	7	8.5	18.8

3.2 The National Contractor Development Programme

Against the picture outlined in the previous section, it is useful to try to quantify the impact of formal Contractor Development Programmes (CDPs) within the overall picture of contractor development in South Africa. Notwithstanding that it is difficult to obtain reliable information regarding the number of contractors that are, or have been, enrolled with CDPs, the limited information available is given in Table 9 (cidb, 2008).

Table 9. Contractor upgrades and Contractor Development Programmes

Programme	Number of Contractors	Grades	Number Graduated	+1 Grade	+2 Grades	+3 Grades
NDPW CIP	134	3 to 7	na	na	na	na
DPW EC CIDP	140	1 to 5	1	5	1	1
DPW KZN Masakhe ECDP	150	2 to 5	0	0	0	0
DPW WC CDP	na	na	na	na	na	na
KZN eThekweni Vukuphile	25	1 to 3	21	18	2	1
KZN eThekweni Large Contractor Model	17	2 to 4	0	6	2	2
ECDC IECDM	62	2 to 5	na	na	na	na
ESKOM Construction Academy	162	1 to 3	38	nc	nc	nc
KZN SECI	126	2 to 7	no	na	na	na
Key: na: not available nc: not a criteria for the Programme objectives						

It is seen from Table 9 that although the information is limited, CDPs have contributed to about 40 upgrades over a period of two years or so – or around 20 upgrades per year. These upgrades are primarily in Grades 2 to 4, and it can be concluded that CDPs are contributing to around 5% of the total upgrades – which in itself is a valuable contribution.

3.3 New Registrations

The previous section has examined contractor upgrading of existing contractors, but it is also instructive to consider new registrations with the cidb. These new registrations are not necessarily new entrants into the industry.

The number of new registrations in General Building and Civil Engineering is given in Table 10, from which it is seen that there are around 15% new registrations in Grades 2 to 9 per year in General Building and around 22% in Civil Engineering. By comparison with Table 6 shown previously, it can be concluded that there are more new registrations per year than upgrades – which confirms the low entry barriers into the industry (at all levels). (Note that many of the new entrants at Grade 9 are international entrants.)

Table 10. Number of new registrations in 2008; General Building and Civil Engineering

From Grade	GB			CE		
	Number of Contractors	New Entrants	%	Number of Contractors	New Entrants	%
9	31	4	13%	56	9	16%
7 & 8	242	19	8%	304	19	6%
5 & 6	779	99	13%	982	112	11%
2 to 4	4 266	656	15%	3 040	840	28%
Total	5 318	778	15%	4 382	980	22%

Of possible concern however is the high number of new registrations in Grades 2 to 4 (namely 15% in General Building and 22% in Civil Engineering) which far exceeds the number of upgrades in these contractor grades – suggesting a highly competitive environment.

3.4 De-Registrations

Upgrades and new registrations have been discussed in the previous sections, but it is also necessary to understand de-registrations within the industry. De-registration could be due to a number of factors, including insolvency.

The number of de-registrations cannot be obtained on an annual basis, and the cidb currently only records aggregated de-registrations since the start of the registers. These can however be converted to an approximate annual number of de-registrations assuming that de-registration has been uniform of the life of the registers to date.

The resulting de-registrations is shown in Table 11 for General Building and Civil Engineering, from which it can be seen that the number of de-registrations is around 5% per year in General Building and 2% in Civil Engineering. The largest number of de-registrations occurs in Grades 2 to 4.

Table 11. Number of de-registrations in 2008; General Building and Civil Engineering

From Grade	GB			CE		
	Number of Contractors	De-Registrations	%	Number of Contractors	De-Registrations	%
9	31	0	0%	56	0	0%
7 & 8	242	4	2%	304	6	2%
5 & 6	779	17	2%	982	12	1%
2 to 4	4 266	224	5%	3 040	91	3%
Total	5 318	245	5%	4 382	109	2%

4. DISCUSSION AND CONCLUSIONS

This paper has investigated contractor development in South Africa using contractor upgrades as a proxy for development. The paper has also considered new registrations, and de-registrations – using information available from the cidb's Register of Contractors.

A summary of contractor upgrades, new entrants and de-registrations is given in Tables 12a and 12b.

Table 12a. Summary of contractor development in 2008; General Building

Contractor Grade	Upgrades From	New Registrations	De-Registrations
9		13%	0%
7 & 8	3%	8%	2%
5 & 6	8%	13%	2%
2 to 4	5%	15%	5%
Total	6%	15%	5%

Table 12b. Summary of contractor development in 2008; Civil Engineering

Contractor Grade	Upgrades From	New Registrations	De-Registrations
9		16%	0%
7 & 8	3%	6%	2%
5 & 6	6%	11%	1%
2 to 4	7%	28%	3%
Total	6%	22%	2%

The key conclusions reached in this paper are discussed below.

- i) Firstly, the number of contractor's upgrading per year is relatively small, typically around 6% per year. This investigation has also shown that contractor upgrading is typically a sustained process over a period of several years – depending on growth in financial capability of the contractor and experience with increasing contract size. Diversification from one class of works to another contributes to the total number of upgrades per year recorded by the cidb, as does formal exposure to training such as through Contractor Development Programmes. Notwithstanding this, the largest number of upgrades appears to be associated with access to work opportunities – which intuitively need to be associated with successful project delivery and an increase in business maturity.
- ii) Secondly, the total number of new registrations is between 15% and 22% per year, which confirms the low entry barriers into the industry. The highest number of new registrations occurs in Grades 2 to 4, suggesting that this sector is becoming increasingly more competitive – which could impact negatively on work opportunities for those contractors who are best able to succeed.

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MANAGING PROJECT WORKING CAPITAL: HOW TANZANIAN LOCAL CONTRACTING FIRMS ARE FARING

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ABSTRACT

Purpose of this paper

A major portion of management time in construction is occupied in managing working capital. This paper examines how local contracting firms in Tanzania manage project working capital.

Design / Methodology / Approach

Questionnaires were administered to both contracting firms and consultants to investigate how contractors manage their working capital. Semi-structured interviews were conducted to cover the questions in the questionnaire and beyond.

Findings

The study reveals that 27% of contractors, most of them in class 5 to 7 do not prepare cash flow plans and in cases where they are prepared the amounts are always less than predicted due to delayed payment by clients and slow progress on site. Again, when the payment is delayed 33% of contractors do not claim interest for fear of losing clients. The study also indicates that all contractors in class 1-4 access finances from financial institutions and trade credits, where as those in class 5-7 only 17% access finances from financial institutions.

Research limitations / implications

The research was limited to only contracting firms who were in close proximity, particularly in urban areas. Future research may be necessary to reach those in districts and townships to draw unbiased conclusions.

Practical implications

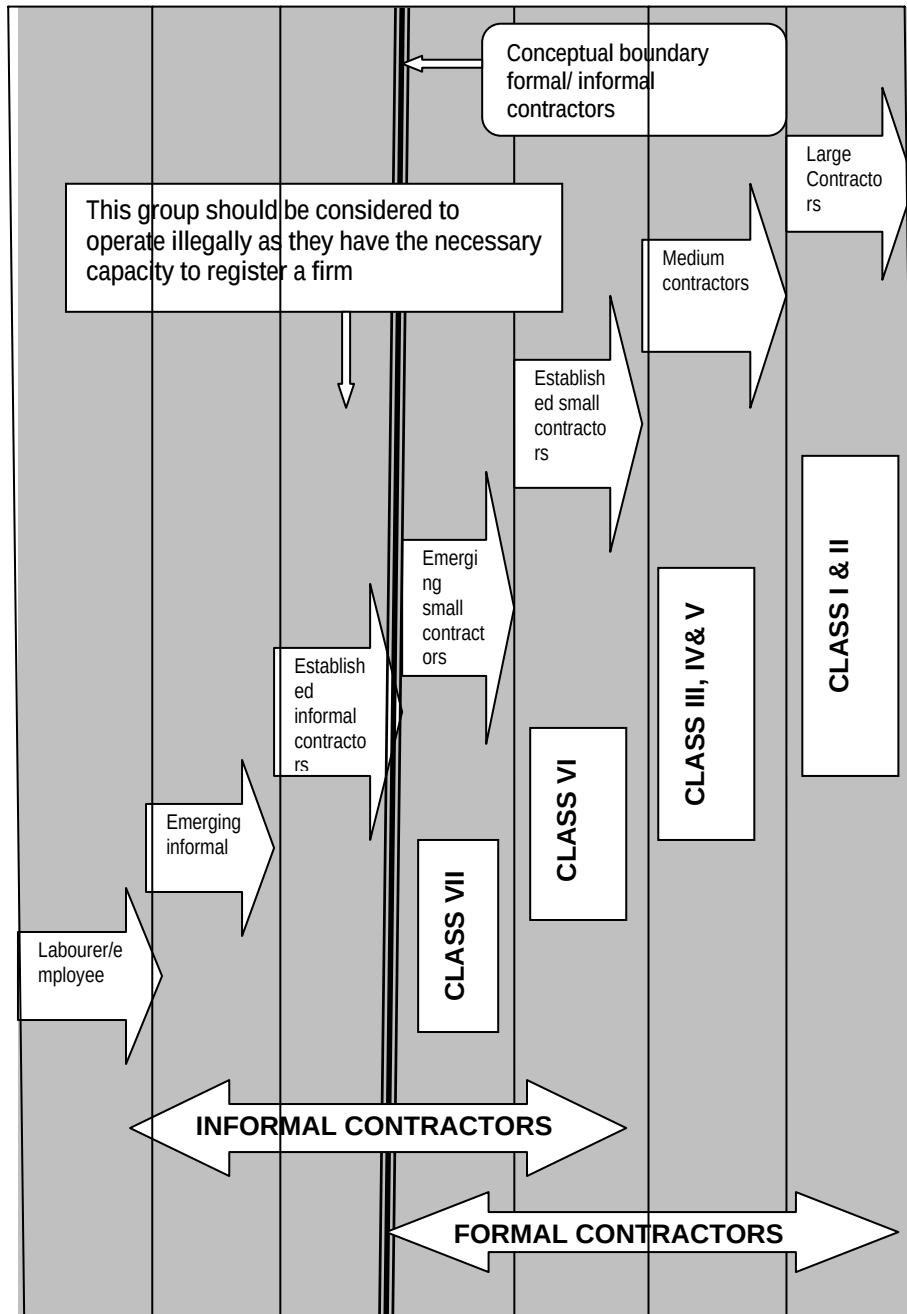
Findings in this paper provide an insight to the financial management of local contracting firms. It also suggests that where necessary contractors in class 5-7 should employ professionals to assist in preparing and updating cash flow plans on part-time or shared bases.

KEYWORDS: contracting firms, management, project, working capital

1. INTRODUCTION

One of the contributions of the construction sector to the economy in any nation is through the provision of Gross Fixed Capital Formation (GFCF). Under GFCF the construction sector products from both building and civil engineering works such as residential, institutional and commercial buildings, bridges, roads, dams, airports, harbours, water supply and sewerage treatment plant are considered. According to the World Bank (1984) the construction works represents one half of the GFCF in developing countries. In Tanzania, the average GFCF contribution over the period of 10 years (1994-2003) was about 46% with a minimum value of 39.3% in 1998 and maximum of 58.4% in 2003. In 2006 the sector's contribution through GFCF was about 50% (The President's Office-Planning and Privatization, 2007)

Contracting firms form a big part of any nation's construction industry as this group is responsible for putting up buildings and other infrastructure. The numbers of contracting firms have been identified as: 200 000 in the United States (Liebing, 2001), 164 000 in the United Kingdom and more than 1 500 000 across the European Union (Myers, 2004), 5 092 in Tanzania (www.crbtz.org) and 48 688 in China (National Bureau of Statistics China, 2004). In Tanzania and many other developing and developed countries small enterprises dominate the sector in terms of numbers, but relatively unimportant in official output. The number of contractors taken in terms of their size forms a pyramid structure, with a few large contractors at the apex and small contractors at the base (United Nations Centre for Human Settlement (UNCHS), 1996; Ofori, 1991; Hildebrandt, 1997). In Tanzania for instance, according to the Contractors Registration Board (CRB) the distribution of contracting firms in each class of registration are such that class one 5%, class two 2%, class three 8%, class four 3%, class five 13%, class six 16%, and class seven 52%. This pattern has raised concerns among researchers and governments. The Government of Tanzania in 1991 argued that a large number of small firms has no future and was undesirable leading to waste of resources and proposed introduction of measures that will reduce the number. UNCHS (1996) and Hindle (1997) argue in favour of the pyramid structure in that small firms are a necessary component of the structure due to the variety of sizes and construction items in every nation and geographical dispersion of works. UNCHS (1996) and Ofori (1991) also support the pyramid structure that large companies were expected to emerge from a large number of small enterprises and considered these enterprises to be useful as they provide a framework for development of the construction industry.



Adopted from Milne (1994)

Figure 1.1 Classification of Contractors According to size

Contracting firms' activities in Tanzania are regulated by the CRB. The firms are registered in classes, the highest being one and the lowest being seven. While Class One contractors are allowed to undertake works of unlimited value, others have class limit values. Furthermore, CRB registers five types of contractors, namely building works, civil works, mechanical, electrical, and specialist contractors.

Table 1.1 Class limit for any single contract (in Million TZS)

CLASS	CIVIL	BUILDING	MECHANICAL	ELECTRICAL	SPECIALIST
ONE	UNLIMITED	UNLIMITED	UNLIMITED	UNLIMITED	UNLIMITED
TWO	4500	1200	750	750	150
THREE	1500	900	450	450	75
FOUR	750	600	300	300	-
FIVE	450	300	150	150	-
SIX	200	150	75	75	-
SEVEN	100	75	30	30	-

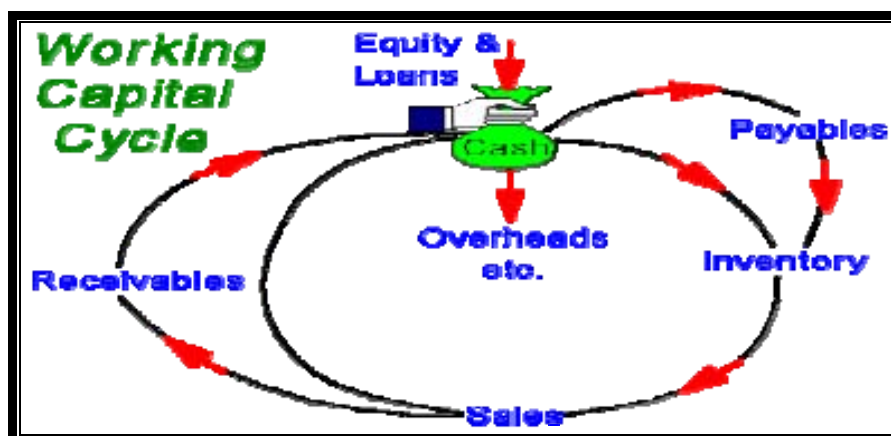
Source: www.crbtz.org

The performance of local contracting firms in Tanzania is daunting. According to Materu (2001) foreign firms constitute less than 3% of total registered firms, but execute about 70% of medium to large contract works. Materu (2001) identifies five critical issues impacting on the performance of contractors in Tanzania one of which is inadequate financing and credit facilities. Saitabau (1999) identifies areas where most small contractors face problems in financial control as:

- lack of prudent financial management;
- misallocation of funds;
- expenditure on areas not related to the business at hand and lack of business and personal budgets;
- financial management failure due to unrealistic estimating and planning, and
- ineffective contract management or inadequate site cost control.

A major portion of management time in construction is occupied in managing working capital. Working capital refers to the cash a business requires for day-to-day operations, or, more specifically, for financing the conversion of certain materials into finished goods (www.sbaer.uca.edu). Working capital is a measure of both a small business's efficiency and its short-term financial health. Short-term working capital financing can be obtained through bank overdrafts, equity, trade credit, and short-term borrowing. During a survey conducted by Saitabau (1999) it was established that contracting firms in Kilimanjaro region were accessing working capital through personal savings, borrowing from friends or relatives, and bank overdrafts or loans. The working capital calculation is:

Working Capital = Current Assets – Current Liabilities



Source: www.sbaer.uca.edu.

Figure 1.2 Working capital Cycle

The predictability of cash inflows and cash outflows is the most basic concern relative to managing working capital. Many contractors have experienced financial constraints when they suddenly and unexpectedly ran out of cash to meet their financial obligations. If the cash inflow exceeds the outflow, the firm has a positive cash flow and thus a good sign of financial health and when the cash outflow exceeds the cash inflow, the firm has a negative cash flow and cannot meet its financial obligations. Construction suffers from several peculiar delays to its cash inflows namely retention monies, contract extension of time, and valuation of variations and the settlement of claims (Hildebrandt, 1990).

The forms of contract widely used in Tanzania, namely the Public Procurement Regulatory Authority (PPRA) general conditions of contract and National Construction Council (NCC) Agreement and Schedule of Conditions of Building contract provide for the contractor to apply for payment in a month and four weeks respectively. The two documents do not consider time taken for preparing valuation and certificate which has an adverse impact on cash flow of the contractor.

2. METHODOLOGY

2.1 Sample frame

About 200 contractors and 100 consultants were envisaged for the survey, but because of the low response to e-mailed questionnaires experienced earlier, questionnaires were e-mailed to all potential respondents whose e-mail addresses were accessed. Interviews were focussed on all consultants and contractors whose telephone numbers could be located.

Consultants were involved in the study to overcome any bias on the part of contractors.

2.2 Questionnaire survey and interviews

Questionnaires were e-mailed to local contracting firms and consultants with e-mail addresses. Semi-structured telephone interviews were conducted with contractors and consultants who acknowledged receiving the questionnaire and who did not respond in time, and also those who did not respond, but whose telephone contact could be accessed and who were ready to be interviewed. A total of 83 responses were received from 28 consultants, and 55 contractors.

3. FINDINGS AND DISCUSSION

Table 1.2 Participants' profile

S/No	Number = 83	(%)
	Respondents	
1	Contractors	66
2	Consultants	34
	Contractors	
1	Class 1	28
2	Class 2	11
3	Class 3	6
4	Class 4	6
5	Class 5	15
6	Class 6	6
7	Class 7	28

The majority (66%) of participants (66%) were contractors. Firms involved in the survey had experience ranging from less than 3 to over 15 years i.e. 4% less than 3 years, 13% 3-5 years and 6-10 years, 9% 11-15 years and 61% over 15 years. More than half of the respondents from the above listed firms were managing directors / partners (55%) followed by managers in various positions namely contracts and project managers (27%).

3.1 Cash flow planning practice

Cash flow planning starts at the pre-contract stage. A quantity surveyor / cost estimator prepares cash flow projection for use by clients in honouring financial obligations. At the tendering stage, bidders are requested to submit the programme works and their cash flow projections. At the time of contract negotiation cash flow forecasts submitted will be updated and included in the contract documents. The cash flow projection prepared at this stage will inform the clients' financial commitments as well as the cash inflows and outflows of the contractor. Figure 1.3 below shows cash flow forecast development from pre-contract to post contract phases. Responses reveal that 27% of contractors, most of them in class 5 to 7, do not prepare cash flow plans. On the other hand, about 50% of consultants indicated that they rarely include the requirements for preparation of cash flow forecasts in tender documents.

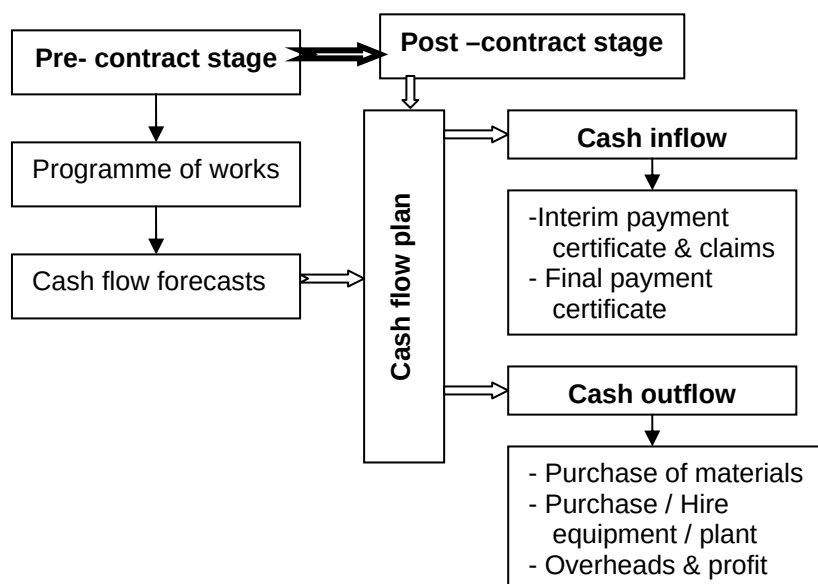


Figure 1.3 Cash flow forecast development

A cash flow plan prepared at the tendering stage and updated during contract negotiation need to be monitored during contract execution. All consultants agreed that they do monitor changes in updated cash flow forecasts. Likewise, most of contractors (79%) review planned expenditure and earnings against actual. In view of the reliability of cash flow forecasts, the respondents' observations are shown in Figure 1.4 below.

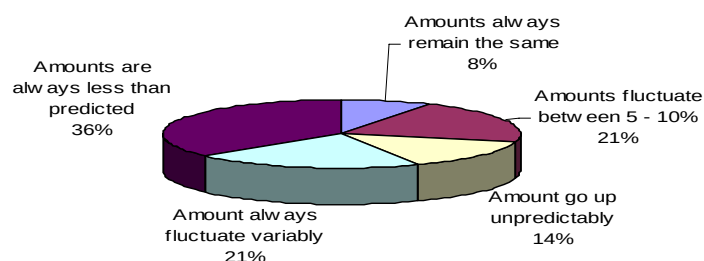


Figure 1.4 Variation in cash flow projected Versus Actual

Figure 1.4 discloses that amounts indicated in cash flow forecasts are always less than predicted (36%) followed by the views that amounts always fluctuate (21%). The reasons for not maintaining projected cash flow were assessed and ranked as shown in Table 1.3 below.

Reason	N	1 (%)	2 (%)	3 (%)	4 (%)	5 (%)	M	SD	R
Delayed payment by the client	83	58	28	21	21	0	2.0	1.2	1
Slow progress on site due to financial constraints	83	32	26	26	11	5	2.2	1.0	2
Delays in procuring materials	83	5	47	16	27	5	2.3	1.1	3
Slow progress on site due to skills shortage	83	5	32	32	11	20	2.4	1.2	4
Delayed details / instructions by the consultant	83	0	16	26	42	16	2.5	1.4	5

SD= Standard Deviation **M**= Mean **R**= Rank

The results in the table above suggest strongly that contractors do not maintain the cash flow projected due delayed payment by the client (mean score = 2). However, 58% of the respondents have indicated that the same affects the cash flow projections very strongly. In addition, responses reveal that payment to contractors is delayed for an average of two to three months (80%), over three months (12%) and for one month (8%). The two forms of contract commonly used in Tanzania provide for payment of interest relative to delayed payment. The contractor, however, is at liberty

to claim such interest. The actions taken by contractors when payment is delayed is indicated in Figure 1.5 below.

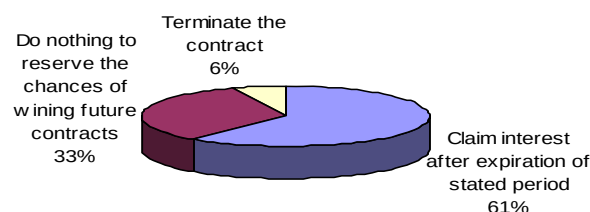


Figure 1.5 Action taken by contractors relative to delayed payment

It is evident that the majority (61%) of contractors claim interest on delayed payment, and a substantial number (33%) of contractors do not claim for fear of losing clients. This finding suggests that 33% of contractors involved in the survey do not think devaluation of money has an effect on their cash flows. Delay of payments does not directly bring a project to a standstill. Contractors have various means of mobilizing funds. Responses indicate that 45% use funds from other projects, 35% secure loans or use overdraft facilities and 20% use personal savings or firm's available balance.

3.2 Finance management

Most (92%) contracting firms keep financial records due to the following reasons:

- to meet the firm's obligations such as paying taxes;
- to judge the level of site overheads and profitability of projects;
- to know the firm's financial position before getting involved in any project;
- to establish a firm's turnover and update the company's profile;
- to assist in accessing loans from financial institutions;
- to assist in future tendering and preparing financial reports.

According to the nature of the business in the construction industry contracting firms access working capital through various sources. The survey indicates that all contracting firms in class 1-4 (51%) access financial support from financial institutions and trade credits i.e. materials and equipment and / or plant suppliers. However, of contracting firms in class 5-7 only 17% access financial support from financial institutions and 50% from trade credits and the rest (33%) from private savings. In addition

66% of the contracting firms indicated that they have failed to pay their debts on time, due to payments from clients being delayed. However, no single firm has admitted to completely failing to pay back the debt.

Apart from the sources of financial support listed above, contractors to a great deal rely on interim payments from the client. Figure 1.6 below shows the time frame for which contracting firms apply for interim payment.

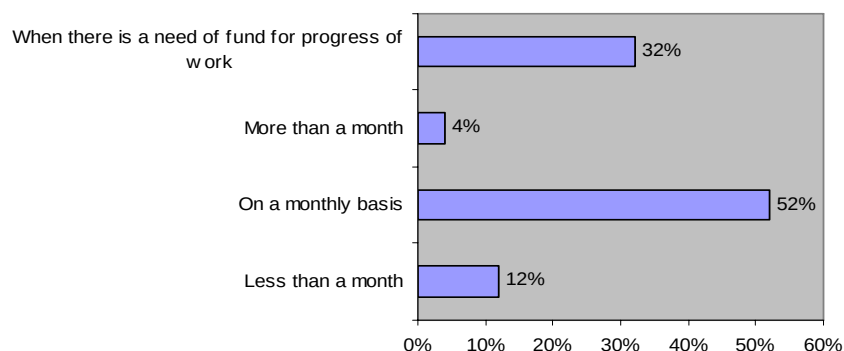


Figure 1.6: Interim payment application internals.

52% of the respondents indicated that contractors apply for payment on a monthly basis, which is in accordance with the forms of contract used in the Tanzanian construction sector. However, it was revealed that most contracting firms in class 5-7 (70% of 32%) apply for payment when there is a need of funds for progress of work. Reasons given for payment application not done on a monthly basis include short term contracts for payment done less than a month; contract terms for payments done in a period that is more than a month, and poor works turnover for payments done monthly.

Another source of finance for the contractor is claims which may result in payments other than stipulated in the contract due to variations, extension of time or loss and damage caused by the employer. Upon occurrence of variation for instance the contractor must give a written notice within 30 days to the Architect in terms of the NCC form of contract, and for the PPRA form of contract the contractor shall warn the project manager at the earliest opportunity of specific likely future events or circumstances that may adversely affect the quality of the work, increase the contract price or delay the execution of the works. Failure to abide to these conditions may lead to the contractor losing such payment. Responses indicate that 88% of contractors prepare claims for payment as soon as they occur, 8% at the end of the project and 4% when there is a need of funds for progress of work. This finding suggests that about 12% of contractors may lose claims payment if the PPRA form of contract is used. Payment certificate clauses in the PPRA and NCC forms of contract have weaknesses, which may lead to contractor failing to plan for the project

cash flow. Both forms of contract are silent on the time from when the contractor applies for payment to when the certificate is prepared. The NCC form of contract states a “reasonable time” for the Architect to issue a payment certificate. Responses indicated that 77% of the respondents suggested that time for preparation of valuation and issuing certificate should be stated because reasonable time to the architect or project manager is not necessarily a reasonable time to the contractor which severely affects the contractor's cash flow. 33% of the respondents supported that the explanation is sufficient to avoid contractors' disturbances.

Contracting firms particularly in lower classes are always blamed for poor funds management. Results of ranking by respondents on the reasons behind poor funds management are shown in Table 1.4 below.

Table 1.4 Reasons for poor funds management in contracting firms

Reason	N	1 (%)	2 (%)	3 (%)	4 (%)	5 (%)	M	SD	R
Lack of proper cash flow planning	83	32	28	28	4	8	2.0	1.2	1
Funds diversification	83	24	44	12	20	0	2.2	1.0	2
Existence of other unrelated line of business	83	28	32	16	12	12	2.3	1.1	3
Management dominated by a single owner/director	83	20	60	8	8	4	2.4	1.2	4
Running a firm as extra curricula activity	83	40	36	8	12	4	2.5	1.4	5

SD= Standard Deviation **M=** Mean **R=** Rank

All factors except running a firm as extra curricular activity were ranked strong in influencing poor funds management. 32% of the respondents ranked lack proper cash flow planning as very strong and almost half (44%) of the respondents ranked funds diversification as strong and more than half (60%) have ranked management dominated by a single owner / director strong.

4. CONCLUSION AND RECOMMENDATIONS

Unfortunately, cash flow planning is lacking in the majority of small and medium enterprises, which form a big part of the contracting community. It was found that 27% of contractors, majority in class 5 -7 do not prepare cash flow plans and in cases where they are prepared the amounts are always less than predicted due to delayed payment by clients and slow progress on site. Again, when the payment is delayed, 33% of contractors

do not claim interest for fear of losing clients. The study also indicates that all contractors in class 1-4 access finances from financial institutions and trade credits, where as 17% of those in class 5-7 access finances from financial institutions and 50% from trade credits, and the rest (33%) from private savings. As managing working capital constitutes a major part of construction management, where necessary, contracting firms in class 5-7 should employ professionals to assist their firm in forecasting and regular updating of cash flow plans on part-time or shared bases. Moreover, local contracting firms must strive to improve their financial capability to win the trust of the lending institutions.

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CLIENTS' VIEWS OF CONSTRUCTION MANAGEMENT COMPETENCIES

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ABSTRACT

Purpose

The purpose of this paper is to determine the ranking of Construction Management competencies according to importance, the extent to which construction managers realise these competencies and to identify the gap between the above mentioned.

Design/methodology/approach

An exploratory study was conducted to develop a list of competencies specific to South Africa and was subsequently followed by a quantitative method of data production using a questionnaire.

Findings

The three most important Construction Management competencies as ranked by Clients are (1) Skills working with emerging contractors (2) Planning and organising skills and (3) Construction contract practice. The three competencies that construction managers are most proficient in are (1) Planning and organising skills (2) Decision making (3) Construction contract practice. The three competencies with the biggest gaps are (1) Skills to work with emerging contractors (2) Quality management / control and (3) Time management.

Originality/value

Tertiary institutions, the Council for the Built Environment (CBE) and the South African Council for the Project and Construction Management Professions (SACPCMP) should address the perceived deficiency relative to the competencies identified by the gap analysis, particularly those competencies that achieved evidence scores below that of the overall average evidence score.

KEYWORDS: Clients, Competencies, Construction Managers

1. INTRODUCTION

Built environment professionals are charged with the responsibility of assessing clients' needs and realising a productive design through added value engineering. This requires the continuing development of skill, application and experience in the knowledge-intensifying cycle (Council for Scientific and Industrial Research [CSIR], 2004). The following quotation included in the SA Construction Industry Status Report – 2004, published by the Construction Industry Development Board (CIDB) (2004), provides insight relative to the performance of the design team: “The quality of delivery varies and clients expressed dissatisfaction particularly with regard to timely preparation of designs, handling of variations, invoicing and final settlement of accounts.”

This article emanates from part of a Doctoral study, and reports on the competencies of Construction Managers based upon responses emanating from private and public sector clients. The input gathered from clients is invaluable as they in essence constitute the primary customers of Construction Managers, and therefore their input may inform the practice of Construction Management. The Johari window may be used to explain the importance of input gathered from others and from self-disclosure. The combination of disclosure and feedback may enlarge the congruence area of the Johari window (Figure 1) as well as help to identify areas of focus for relevant future education and training of Construction Managers.

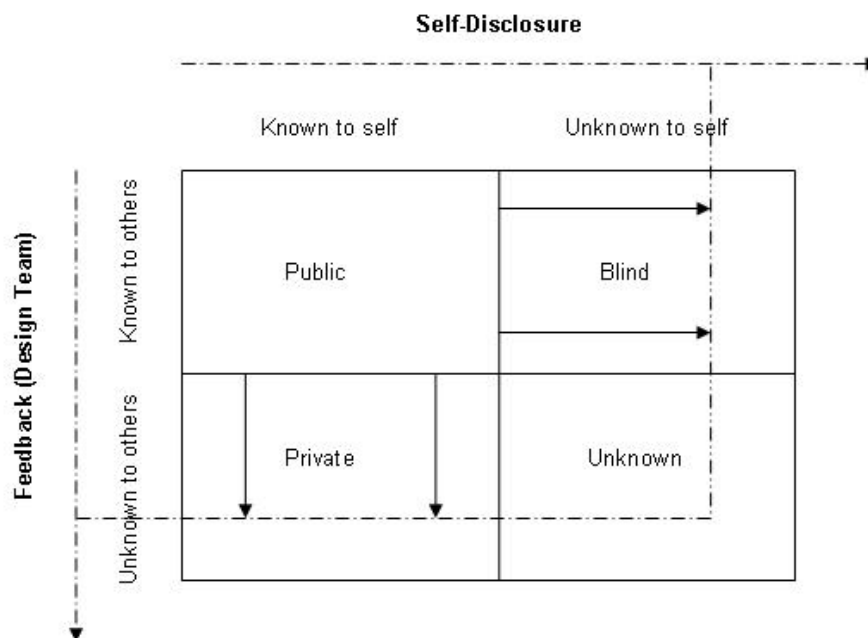


Figure 1 Johari window (Robbins, 1998)

According to Robbins (1998), proponents of the Johari window imply that perceptual accuracy and communication would be improved if the size of the Public area were expanded by increasing self-disclosure and by acceptance of feedback from others even if such feedback is unflattering.

Smallwood (2000) conducted research to investigate the competencies which Construction Managers should possess. The respondents, Construction Managers, were requested to rank 29 competencies. Thus, it may be argued that self-disclosure did take place and that the Johari Public area was widened. The aim of this research is to:

- Obtain feedback from the clients on the competencies required by Construction Managers;
- Reveal the extent to which Construction Managers realise client requirements as per client perception, and
- Develop a meaningful model of the competencies.

This research intends to secure feedback from clients regarding Construction Management competencies. Upon completion of the research the Johari Public area should be even larger, yielding vital feedback for the Construction Management profession. Follow-up research will have to be conducted in order to include the design team's (Architects, Engineers, and Quantity Surveyors) perception on Construction Management competencies which will expand the Johari Window Public area to its maximum. When all stakeholders have contributed towards the process each stakeholder's perception may be weighted according to importance in order to obtain the final ranking of each competency in relation to importance and evidence.

2. REVIEW OF THE LITERATURE

2.1 Construction Management competencies

Construction management is an integrated process of coordination and regulating the inputs of parties involved in a construction project to accomplish prescribed objectives (Shirazi and Hampson, 1998).

The Chartered Institute of Building (CIOB, 1997) identified nine competence areas for the Professional Development Programme, which is required for individuals to become full chartered members of the body. This provided detailed guidance for degree course providers to design their course accordingly. The competencies identified by the CIOB are Decision making; Communication; Managing information; Planning work; Managing quality work; Managing health and safety; Managing resources; Assess environmental risk factors; Managing costs, and Personal management at work.

The research conducted by Smallwood (2000) investigated inter alia, the competencies which construction managers should possess. The

respondents were requested to rank 29 competencies. The competencies included Administration; Negotiating; Computer literacy; Numerical (maths); Conflict resolution; Oral communication; Controlling; Organising; Coordinating; Personnel management; Costing; Plan Reading; Decision making; Planning; Entrepreneurial; Practical; Estimating; Report writing; Financial management; Surveying (setting out *etc.*); Graphic communication; Team building; Initiating; Technical expertise; Interpersonal; Time management; Leadership; Written communication, and Measuring (quantities).

The competencies included in this research are a combination of the competencies used in the research by Smallwood (2000) and those emanating from the survey of the literature. Although all the competencies that were identified by Smallwood (2000) are included in the research reported on in this paper, some were combined to form a single competency. Furthermore, the wording of various competencies is different in order to combine competencies that were similar in nature.

The 32 competencies used in this research are Advanced financial management; Arbitration and other dispute resolution procedures; Computer literacy and information technology; Construction contract practice; Construction technology and environmental services; Coordinating; Cost control; Decision making; Economics of construction; Estimating; Human resources skills; Law; Leadership and general management skills; Macro-economic perspectives; Marketing; Measuring (Quantities); Negotiating; Personal and interpersonal skills; Planning and organising skills; Procurement; Professional practice; Project management; Quality management / control; Research methodologies and techniques; Risk management; Skills in managing a business unit; Skills to work with emerging contractors; Structural knowledge; Surveying (setting out *etc.*); Time management; Valuation, and Value management. The above mentioned competencies encompass all the exist levels published by the South African Qualification Authority (SAQA).

3 RESEARCH

3.1 Methodology

The descriptive survey method was employed to process the data obtained through observation. This type of research involves either identifying the characteristics of an observed phenomenon or exploring possible correlations among two or more phenomena. In every case, descriptive research examines a situation as it is. It does not involve changing or modifying the situation under investigation, nor does it intend to determine cause-and-effect relationships (Leedy & Ormond, 2005). Thus, it observes existing conditions artificially, and is limited to ascertaining and describing

the characteristics of the variables of interest in a given situation (Cropley & Harris, 2004).

An exploratory study was conducted to enable the development of an optimum list of competencies. A qualitative approach was adopted during this phase which entailed the interviewing of ten Architects, Construction Managers, Engineers, Project Managers, and Quantity Surveyors in the Eastern Cape and Western Cape. The interviews investigated the various disciplines' understanding of their own competencies, and the competencies of the other disciplines', with the possibility of adding additional competencies to the pilot questionnaire. Subsequently, during the primary study, a quantitative method of data production using a questionnaire was followed.

The populations of respondents in the primary study can be divided into two categories:

- Public sector clients – a mailing list of all the Municipal Managers in South Africa was obtained from the Department of Water Affairs, and
- Private sector clients – a mailing list of all the property developers in South Africa was obtained from the South African Property Owners Association (SAPOA).

The total number of property developers or private sector clients on the SAPOA mailing list totalled 74 members. The total number of Municipality managers or public sector clients on the mailing list obtained from the Department of Water Affairs totalled 284.

3.2 Questionnaire design

The questionnaire consisted of three sections. Section one consisted of demographic questions, which were later used to test if any of the variables had a significant influence on the rating of the competencies.

In section two, each disciplines' competencies were listed in alphabetical order with two accompanying scales, namely level of importance and evidence of competencies. The questionnaire was designed to include all the competencies which were gathered during the survey of the literature and during the exploratory phase interviews. The method of presenting all the competencies and then asking the respondents to rate the competencies according to current importance and evidence on the Likert scale was adopted from Nkado (1999). The two scales were:

- The level of importance of a competency for a career in a specific discipline at present, from 1 (not important) to 5 (very important), and
- How evident that competency is in the specific discipline in South Africa, from 1 (poor) to 5 (excellent).

Section three included a scale in which the respondents had to rate the level of importance of the performance parameters to clients, from 1 (not important) to 5 (very important).

3.3 Sample size and response rate

Krejcie & Morgan (1970) suggest appropriate sample sizes for effective representation of the target population. However, the author deemed it erudite to survey the target population due to the poor response rate in construction related studies.

Of the 358 questionnaires posted, 59 were returned 12 weeks after the initial mailing - this equates to a response rate of 16.8%. However, 8 of the returned responses could not be included in the analysis of the data as not a single response had been recorded thereon. It is notable that no reasons were provided for returning the questionnaires blank. Therefore, the effective response rate was 14.5% as shown in Table 2. However, when comparing the amount of completed questionnaires to the sample size recommended by Krejcie & Morgan (1970), it represents a 22.8% response rate. In essence, this response rate is not far below the 25% response rate recommended by Nkado (1999) for construction research.

Table 2 Analysis of respondent sample

Sector	Useful questionnaires (No.)	Questionnaires posted (No.)	Required sample size (No.)	Response rate of census (%)	Response rate of required sample size (%)
Public	38	284	165	13.4	23.0
Private	14	74	63	18.9	22.2
Total	52	358	228	14.5	22.8

3.4 Rescaling data

Re-scaling is an explanatory, rather than causal analysis as the rescaled values are for the full set of observations over all the constructs that are rated. This limitation means that rescaling does not indicate how each respondent used the scale for each statement that was rated. According to Bendixen & Sandler (1995) "in some instances, the subsequent analyses produce results that are almost identical to those obtained when the assumption that the original ordinal data behaved in an interval fashion was made or that the analytic techniques used were sufficiently robust. However, in equally as many instances, the interpretation of subsequent analyses was 'cleaner', easier and more precise."

Bendixen & Sandler (1995) and Nkado & Meyer (2001) argue that this procedure is essential for parametric manipulation and interpretation of the raw data. The conversion of the Likert scale was performed separately

for each of the two sets of ratings of important competencies and evidence of the competencies. Table 3 illustrates the conversions for ratings of important competencies based on a correspondence analysis of the ratings received for the 32 competencies. The rescaling shows that any assumption that the original ratings interval in nature would be questionable.

Table 3 Re-scaling for rating of important current competencies

		Eigen Value		Cum. Percent retained	
Likert scale of importance		Axis 1	0.13355	69.32	
		Axis 2	0.03075	85.28	
		Axis 1 co-ordinate	Axis 2 co-ordinate	Euclidean distance	Adjusted scale
1	Not important	1.196	-0.479		1.0000
2		0.713	0.07	1.3941	2.3941
3	Important	0.761	0.25	0.4245	2.8187
4		0.068	-0.213	1.3336	4.1523
5	Very important	-0.294	0.105	0.8477	5.0000

3.5 Relative importance of competencies

After re-scaling the ordinal data to interval data, the means of the competencies were computed. The means were then converted to percentage ratings. Table 4 presents the importance and evidence ratings, and the percentage gap between the aforementioned.

The five most important current competencies required by Construction Managers as ranked by clients are Skills to work with emerging contractors, Planning and organising skills, Construction contract practice, Time management, and Quality management / control. All the competencies were ranked as above average in terms of current importance.

The five competencies that Construction Managers are most proficient in according to clients are Planning and organising skills, Decision making, Construction contract practice, Project management, and Measuring (Quantities).

The top five competencies in terms of deficiency as represented by the gap analysis are Skills to work with emerging contractors, Quality management / control, Time management, Arbitration and other dispute resolution procedures, and Construction technology and environmental services. It is notable that three of these are among the five most important current competencies.

Table 4 Importance and evidence of Construction Management competencies

Construction Management Competencies			
Competency heading	Importance	Evidence	% Gap
Skills to work with emerging contractors	94.89%	69.02%	25.87%
Planning and organising skills	93.54%	78.52%	15.02%
Construction contract practice	93.35%	77.46%	15.89%
Time management	92.41%	73.05%	19.36%
Quality management/control	92.38%	71.49%	20.89%
Cost control	92.01%	75.29%	16.72%
Project management	91.82%	76.77%	15.05%
Coordinating	91.50%	74.35%	17.15%
Leadership and general management skills	91.25%	76.48%	14.77%
Decision making	91.22%	77.89%	13.33%
Economics of construction	90.45%	76.18%	14.27%
Estimating	89.69%	75.15%	14.54%
Construction technology and environmental services	88.99%	70.44%	18.55%
Personal and interpersonal skills	88.96%	72.49%	16.47%
Procurement	88.27%	75.95%	12.32%
Measuring (Quantities)	87.78%	76.51%	11.27%
Human resources skills	87.24%	70.10%	17.14%
Negotiating	87.06%	73.96%	13.10%
Risk management	86.59%	69.31%	17.28%
Professional practice	85.84%	74.69%	11.15%
Computer literacy and information technology	85.68%	72.91%	12.77%
Arbitration and other dispute resolution procedures	85.49%	66.47%	19.02%
Skills in managing a business unit	85.30%	71.43%	13.87%
Advanced financial management	85.14%	67.84%	17.30%
Surveying (setting out etc.)	85.06%	73.65%	11.41%
Structural knowledge	82.58%	69.13%	13.45%
Value management	81.80%	70.19%	11.61%

Valuation	79.18%	69.21%	9.97%
Law	78.55%	64.56%	13.99%
Marketing	73.75%	63.26%	10.49%
Macro-economic perspectives	72.81%	64.65%	8.16%
Research methodologies and techniques	72.05%	60.49%	11.56%

3.6 Principal Component analysis

Principal Components Analysis (PCA) is a data analysis tool that is usually used to reduce the dimensionality or number of variables of a large number of interrelated variables, while retaining as much of the information or variation as possible. PCA calculates an uncorrelated set of variables such as factors or PCs. These factors are ordered so that the first few retain most of the variation present in all of the original variables. Unlike its cousin Factor Analysis, PCA always yields the same solution from the same data, apart from arbitrary differences in the sign.

Principal component analysis was applied to ratings of importance of the 32 competencies in the questionnaire. The principal analysis was carried out on the re-scaled data. Several methods have been proposed for determining the number of factors that should be kept for further analysis. Several of these methods will now be discussed. However, remember that important information about possible outliers and linear dependencies may be determined from the factors associated with the relatively small eigenvalues, so these should be investigated as well.

The following methodology was adopted relative to the selection of factors:

- All factors with an eigenvalue greater than one were eligible for selection;
- Visual inspection of the scree plot was undertaken to see where the 'knee' is. The 'knee' of the curve indicates the number of factors to use;
- The percentage of total variance should generally be above 35% (Nkado, 1999; Zikmund, 1994), and
- All the variables should be represented in the factors chosen.

The first eight factors all had eigenvalues higher than one, but when looking at the scree plot it can be seen that only five are needed. However, due to one competency not featuring in the five factor solution, the six factor solution was chosen. The six factors explain 72.81% of the inertia, which is above the 35% needed. The Varimax rotation of the six-factor solution was used so that only one factor gets a high loading for each competency in order to simplify the interpretation of the factors - only the loadings greater than 0.4 were considered to be relevant. Variables loaded onto more than one factor were placed under the factor that the variable had the highest loading.

Factor 1: This factor is labelled as 'Control and Decision making'. The average importance ranking of the competencies in this factor is 12.3, which gives it a rank of third between the factors. This factor supports Factor 4 and 6 which encompasses competencies with higher importance ratings.

Factor 2: Factor two encompasses most of the competencies to do with the administration of contracts. Thus, this factor is named 'Contract Administration'. The average importance ranking of the competencies in this factor is 19.9, which gives it a rank of sixth between all the factors. This factor supports Factor 4 and 6 which encompasses competencies with higher importance ratings.

Factor 3: This factor is labelled as 'Legal and Financial Management'. The average importance ranking of the competencies in this factor is 19.6, which gives it a rank of fifth between the factors. This factor supports Factor 4 and 6 which encompasses competencies with higher importance ratings.

Factor 4: This factor is labelled as 'Construction Technology and Practice'. The average importance ranking of the competencies in this factor is 10.3, which gives it a rank of second between the factors. This factor is also considered to be one of the principal factors as depicted in the model.

Factor 5: This factor is labelled as 'Commercial Management'. The average importance ranking of the competencies in this factor is 16.6, which gives it a rank of fifth between the factors. This factor supports Factor 4 and 6 which encompasses competencies with higher importance ratings.

Factor 6: This factor is labelled as 'Execution'. The average importance ranking of the competencies in this factor is 6, which gives it a rank of first between the factors. This factor is also considered to be one of the principal factors as depicted in the model.

3.6 Model

The model (Figure 3) indicates that the factors are interdependent and interact. The model also indicates that Factors 4 and 6 which consist of the primary competencies for effective Construction Management are supported by Factors 1, 2, 3 and 5 which are mostly secondary competencies. These factors in turn are influenced by the inter-relationships between the practitioners, continuing professional development (CPD) / research and universities, which in turn are influenced by the CBE, and the SACPCMP. These two organisations are ultimately influenced by the local and global environment.

In essence, the model highlights the importance of a sound working relationship between the stakeholders involved in the practice of Construction Management.

4. CONCLUSIONS

Based upon the predominating competencies in terms of importance, it may be concluded that Construction Managers are perceived to fulfil their traditional role of coordination and regulating the inputs of parties involved in a construction project to accomplish prescribed objectives. The results of the PCA, namely the first and second ranking of 'Factor 4: Construction Technology and Practice' and 'Factor 6: Execution' respectively, reinforce this conclusion. However, attention needs to be paid to Skills to work with emerging contractors, Quality management / control, Time management which are ranked under the top five most important competencies and top five competencies in terms of deficiency as represented by the gap analysis.

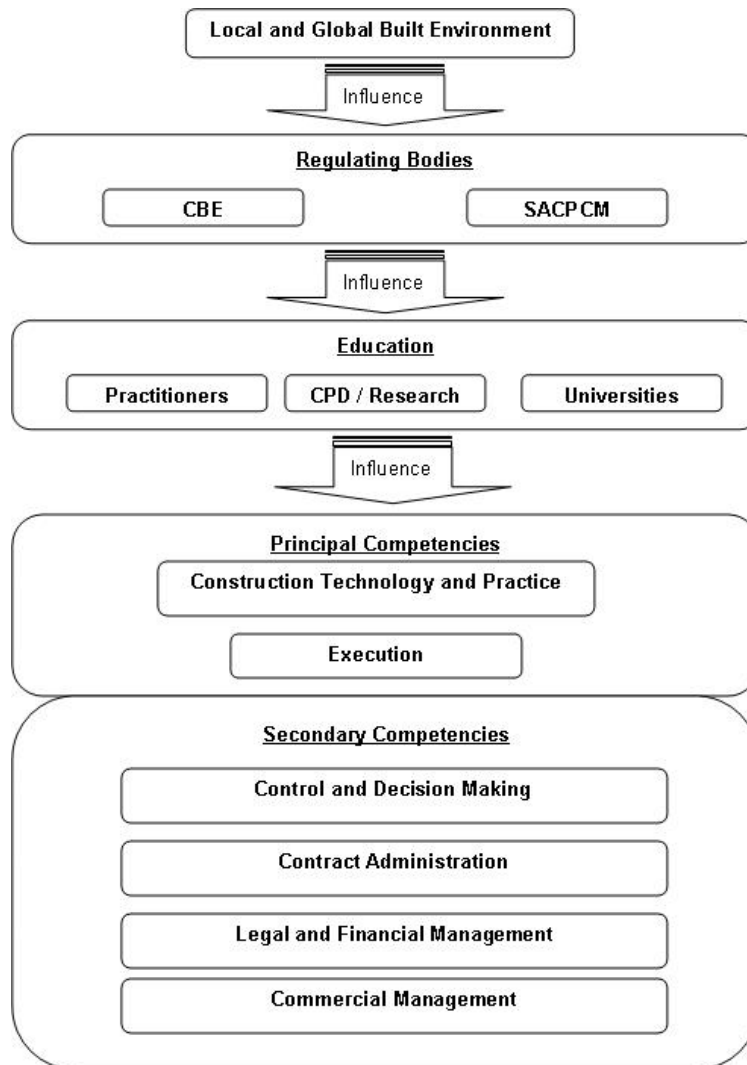


Figure 3: Construction Management competency model

5. RECOMMENDATIONS

It is recommended that tertiary institutions, the CBE, and the SACPCMP should address the perceived deficiency relative to the competencies identified by the gap analysis, particularly those competencies that achieved evidence percentage scores below that of the overall average evidence percentage score. This recommendation requires interventions

during curricula design, accreditation, assessment of professional competency, and continuing professional development.

Finally, the Construction Management profession should re-assess its role in the built environment.

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CONSULTANTS' AND CLIENTS' PERSPECTIVES ON THE CONSTRUCTION INDUSTRY AS CAPTURED BY THE CIDB SURVEY OF CONSTRUCTION INDUSTRY INDICATORS 2007

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ABSTRACT

Purpose

Annual monitoring of the condition of the South African construction industry is vital to enable government and other role players to evaluate the impact of current interventions and to timely and pro-actively implement revised legislation, strategies and development programs to ensure the well-being and growth of the industry to achieve the targeted goals. This monitoring of the construction industry is done annually by the Construction Industry Development Board (cidb) in partnership with the Department of Quantity Surveying and Construction Management of the University of the Free State.

Methodology

A database with contact particulars of contractors, clients and consultants involved in 765 projects completed in 2006 was compiled.

Three separate survey forms were faxed or e-mailed to the contractors, clients and consultants of these projects. Their responses were captured in a Microsoft Access database. This is a second paper based on the research findings and the scope of this paper is limited to the responses received from the consultants and clients. Where possible the results were compared with those obtained from previous similar surveys.

Findings

The survey indicated that only 65% of all projects started on time and only 34% of all projects were completed on time. This seriously hampers governments' delivery goals. Client bodies were generally speaking satisfied with their contractors' and consultants' performance.

Research limitations

The research questionnaire completed by clients included questions regarding project milestones dates achieved, construction costs versus budget, contractors' performance, consultants' performance and the quality of materials used. The consultants reported on the procurement methods used and contracting strategies adapted.

Practical implications & Value

Government can make use of the results obtained to timely and pro-actively implement revised legislation, strategies and development programs to ensure the well-being and growth of the industry.

Keywords: construction industry indicators, kpi, cii

1. INTRODUCTION

The Construction Industry Development Board (cidb) Act (Republic of South Africa, 2000) was passed in 2000 to establish a statutory body aimed at driving an integrated construction industry development strategy. In terms of this act the cidb 'may develop target and performance indicators related to those best practice standards and guidelines and establish mechanisms to monitor their implementation and evaluate their impact'. Construction Industry Indicators (CIIs) have been developed by the Department of Public Works and the cidb with assistance from the CSIR (van Huyssteen, van Heerden, Perkins & Gyimah, n.d.: Online) to play a useful role in developing a sustainable industry and to be adopted as a tool for improving performance in the South African construction industry.

The CIIs of the cidb rely heavily on international experience and particularly those indicators adopted in the United Kingdom. In the United Kingdom the first Key Performance Indicators (KPIs) were published in 1999 in response to the *Rethinking Construction* report by Egan (1998). These KPIs had three objectives, namely (Rethinking Standards in Construction, 2006: 3):

- To provide companies and projects with a simple method of establishing a performance measurement system;
- To provide organisations with a straightforward method of benchmarking their performance against others in the construction industry; and

- To track long term trends in performance, and specifically, to demonstrate whether the construction industry was achieving the targets set out in *Rethinking Construction*.

Cost, time and quality are the three basic and most important performance indicators in construction projects followed by others such as safety, functionality and satisfaction (Chan & Ada, 2004: 203-221). Based on the Egan report the Movement for Innovation and Construction Best Practice Programme (CBPP) was formed and is now recognised as a leading organisation involved in the production of KPIs within the industry (Beatham, Anumba & Thorpe, 2004: 93-117). The KPIs launched by the CBPP are: client satisfaction, product and service, profitability, productivity, defects, safety, predictability of time and cost, construction time and construction cost. These KPIs were benchmarked within the construction industry and have been very successful in introducing many companies to the subject of performance measurement (Beatham *et al.*, 2004: 93-117).

The cidb CIs measure the performance of the South African construction industry by measuring client satisfaction with the project milestone dates achieved, construction costs versus budget, contractors' performance, consultants' performance, and the quality of materials used. The contractors' satisfaction is measured by their profitability, the quality of the contract documentation, the efficiency, openness and transparency of the contract adjudication process, the management of variation orders, payment delays and the performance of their materials suppliers. The procurement indicators measured include contractor performance issues utilised in the adjudication of tenders, the type of procurement procedure used, and the contracting strategy adopted. Compliance with the cidb's Standard for Uniformity (Republic of South Africa, 2008: 45) intervention regarding allowable forms of contract is also measured.

The cidb CIs measured above have been captured since 2003, and are currently being captured in partnership with the Department of Quantity Surveying and Construction Management of the University of the Free State. A summary of the 2007 survey results has already been published (cidb, 2007). This is a full report on the results of the 2007 survey for projects completed in 2006. The results of the 2005 survey are also presented with the purpose to make comparisons where possible, but are not discussed in detail.

2. METHODOLOGY

A database with contact particulars of clients, contractors and consultants involved in projects completed in 2006 was compiled. The completed projects were identified and the contact particulars of the contractors involved in these projects were obtained from the cidb's register of contractors. These contractors were requested to provide the contact

particulars of the client and consultant for each of their projects. These contact details were verified with the relevant clients and consultants, and they in turn were also requested to provide the names of their other projects completed in 2006 together with the contact particulars of the other parties involved. In this way, a database of 756 completed projects was compiled.

Three separate survey forms were faxed or e-mailed to the contractors, clients and consultants of these projects. Their responses were captured in a Microsoft Access database.

3. SCOPE

The CIIs of the cidb need to evolve from the lessons learned from previous surveys, and are therefore subject to change and refinement. This is the reason why it is not always possible to compare results with those obtained from previous surveys. The CIIs considered in this report are only the project related indicators. The cidb also measures health & safety and empowerment progress which are not discussed in this report. Other economic indicators such as production prices, and building plans passed are published elsewhere.

This is a second paper on the research findings and the scope of this paper is limited to the responses received from the clients and consultants. The first paper presenting the responses received from contractors was published by Marx (2008). From the 756 completed projects in the database, 153 survey forms were received back from consultants and 113 from clients.

4. DISCUSSION OF THE CONSULTANTS' SURVEY RESULTS

4.1 Project type and client category distribution of responses received

Tables 1 & 2 give a summary of the survey forms completed by consultants for projects completed in 2004 and 2006 respectively.

Table 1: Survey responses received for different project types & client categories 2004

Project Type	Total No.	42%	4%	18%	6%	24%	6%	0%	% of Total Survey Results
Residential Building	12	6	0	2	0	4	0	0	4%
Non-residential Building	132	91	4	24	8	5	0	0	42%
Civil Works	171	34	8	30	12	67	20	0	54%
Mechanical Works	0	0	0	0	0	0	0	0	0%

Electrical Works	0	0	0	0	0	0	0	0	0%
Special Works	0	0	0	0	0	0	0	0	0%
	315	131	12	56	20	76	20	0	Total No.
		Private sector	Public Corporation e.g. ESKOM, ACSA	National Department	Provincial Department	Metropolitan Council	Regional / District Council	Public Private Partnership	
		Client Category 2004							

The number of survey forms completed is indicated for different client categories and project types.

It is clear from both tables that the majority of responses received were from civil works and non-residential building projects. For projects completed in 2006, civil and non-residential projects represent 55% and 32% of all responses respectively. The results in this report are therefore presented per project type and per client category to ensure that the results for other project types do not disappear in the average of all projects.

Table 2: Survey responses received for different project types and client categories 2006

Project Type	Total No.	16%	7%	5%	35%	11%	25%	1%	% of Total Survey Results
Residential Building	10	6	0	0	2	1	1	0	6%
Non-residential Building	49	8	4	2	29	2	3	1	32%
Civil Works	84	9	7	4	19	13	32	0	55%
Mechanical Works	6	1	0	1	2	0	2	0	4%
Electrical Works	1	1	0	0	0	0	0	0	1%
Special Works	3	0	0	1	1	1	0	0	2%
	153	25	11	8	53	17	38	1	Total No.
		Private sector	Public Corporation e.g. ESKOM, ACSA	National Department	Provincial Department	Metropolitan Council	Regional / District Council	Public Private Partnership	

Client Category 2006

Most results were received for provincial department projects (35%) and regional / district council projects (25%) followed by private sector projects (16%). It is important to note that only one survey form was received for a public private partnership project in 2006 and the opinion is thus from a single consultant which cannot be considered an average response. The response level is much lower than for the previous survey.

4.2 Type of contract document used

Table 3 shows the distribution of the type of contract document used for each project type for projects completed in 2006.

Table 3: Type of contract document used for different project types 2006

Project Type	% Contract Document Type usage for each Project Type					Total
Residential Building	33	-	56	-	11	100
Non-residential Building	10	2	69	-	19	100
Civil Works	64	-	1	11	24	100
Mechanical Works	33	-	33	17	17	100
Electrical Works	-	-	-	-	100	100
Special Works	-	-	100	-	-	100
Contract Document Type	GCC 2004	NEC	JBCC 2000	FIDIC 1999	OTHER	
% Projects with Contract Document significantly amended	18	-	23	30	-	

It is clear that the GCC 2004 was the most popular contract form for civil projects (64%) while the JBCC 2000 contract, which is a building contract, was the most widely used for residential (56%), non-residential building (69%) and special works projects (100%). For mechanical works contracts, both the GCC 2004 and JBCC 2000 contract forms were popular with a usage of 33%. Table 3 also indicates that the conditions of contract for 18% of all GCC 2004 contracts were significantly amended with issues such as the mitigation of risk and delegation of responsibility. Similarly, 23% of JBCC 2000 contracts and 30% of FIDIC 1999 contracts were also significantly amended.

4.3 Contractor performance issues utilised in the adjudication of tenders

Consultants were requested to indicate which contractor performance issues were taken into account during the tender adjudication process for public sector projects and the results are indicated in Tables 4 & 5 in terms of client categories.

Table 4: Contractor performance issues used in the adjudication of tenders 2004

Performance Issues	% of Projects in each Client Category using different Performance Issues					
Price	9	4	17	5	11	-
Price & functionality	18	2	5	52	33	-
Price & preference	9	10	11	14	17	-
Price & functionality & preference	64	84	67	29	39	-
	Public Corporation e.g. ESKOM, ACSA	National Department	Provincial Department	Metropolitan Council	Regional / District Council	Public Private Partnership
Public Sector Client Category 2004						

Table 5: Contractor performance issues used in the adjudication of tenders 2006

Performance Issues	% of Projects in each Client Category using different Performance Issues					
Price	9	0	6	6	9	0
Price & preference	45	33	33	63	34	0
Price & functionality & preference	46	67	61	31	57	100
	Public Corporation e.g. ESKOM, ACSA	National Department	Provincial Department	Metropolitan Council	Regional / District Council	Public Private Partnership
Public Sector Client Category 2006						

In 2006 only 6% to 9% of public sector projects were still adjudicated on price only. There was a definite decrease in the use of price only as criteria for adjudication in most client categories if the survey results for projects completed in 2006 are compared with the results for 2004. Except for projects of the metropolitan councils, the use of price, preference as well as functionality is more popular which is a very good sign, as quality of work and a good contractor track record should be promoted. However, it is unknown whether tender scoring points are also allocated for functionality, and whether the consultants' tender adjudication recommendations were followed in the allocation of tenders. These are issues that should be considered.

4.4 Procurement procedures used to solicit tenders

Tables 6 & 7 show the distribution of procurement procedures used to solicit tenders for different client categories in 2004 and 2006 respectively.

Table 6: Procurement procedures used to solicit tenders 2004

Procurement Procedure	% of Projects in each Client Category using different Procurement Procedures					
	Public Corporation e.g. ESKOM, ACSA	National Department	Provincial Department	Metropolitan Council	Regional / District Council	Public Private Partnership
Negotiated	-	9	10	8	10	-
Nominated / Selected	-	2	-	17	-	-
Open	78	89	80	69	75	-
Qualified	22	-	10	4	15	-
Quotation	-	-	-	2	-	-
Two Envelope System	-	-	-	-	-	-
Two Stage System	-	-	-	-	-	-
Public Sector Client Category 2004						

Table 7: Procurement procedures used to solicit tenders 2006

Procurement Procedure	% of Projects in each Client Category using different Procurement Procedures					
	Public Corporation e.g. ESKOM, ACSA	National Department	Provincial Department	Metropolitan Council	Regional / District Council	Public Private Partnership
Negotiated	-	-	-	-	3	-
Nominated / Selected	9	17	2	6	-	-
Open	73	83	90	88	94	-
Qualified	-	-	6	-	-	100
Quotation	18	-	2	6	-	-
Two Envelope System	-	-	-	-	-	-
Two Stage System	-	-	-	-	3	-
Public Sector Client Category 2006						

Open tenders was the most popular tender procurement procedure followed. The quotation procedure used by a few client bodies is likely only utilised for very small tenders. The 100% use of the qualified procedure in the public private partnership category is again representative of one project only.

4.5 Contracting strategy adopted

The distribution of contracting strategies adopted by different client categories is shown in Tables 8 & 9 for projects completed in 2004 and 2006 respectively.

Table 8: Contracting strategies adopted for different client categories 2004

Contracting Strategy	% Projects with Contracting Strategy for different Client Categories						
	Design & Build	Develop & Construct	Design by Employer	Management Contract	Construction Management	PPP	
2004	33	14	25	17	10	1	-
	11	45	22	22	11	-	-
	27	36	6	4	4	-	-
	16	32	10	21	4	-	-
	59	4	15	15	3	-	-
	33	17	33	11	6	-	-
	-	-	-	-	-	-	-
	Client Category						
	Private Sector	Public Corporation	National Department	Provincial Department	Metropolitan Council	Regional/District Council	Public Private Partnership

Table 9: Contracting strategies adopted for different client categories 2006

Contracting Strategy	% Projects with Contracting Strategy for different Client Categories						
	Design & Build	Develop & Construct	Design by Employer	Management Contract	Construction Management	PPP	
2006	24	-	64	4	4	4	-
	9	9	73	-	9	-	-
	13	12	63	-	-	12	-
	4	29	58	2	3	4	-
	7	13	73	7	-	-	-
	8	3	76	8	3	2	-
	-	-	-	-	100	-	-
	Client Category						
	Private Sector	Public Corporation	National Department	Provincial Department	Metropolitan Council	Regional/District Council	Public Private Partnership

Currently, the design by employer strategy is most popular for all client categories except for the public private partnership response for only one project. There is a definite reduction in the use of design and build and management contract strategies, and an increase in the design by

employer strategy if the results for projects completed in 2004 are compared with those completed in 2006.

4.6 Payment delays

The average number of days delay between submission of professional fee accounts and receipt of payment is shown in Tables 10 and 11. For 51% of the projects, fees were paid before 30 days which is a slight improvement on the previous survey of 47%. There is a small increase from 7% to 9% of projects for which fees were only paid after 60 days, when comparing the 2004 and 2006 results. The national and provincial departments were the slowest payers of fees with fees on 14% of all projects that were only paid after more than 60 days.

Table 10: Payment delay of consultant's fees for different client categories 2004

Avg. Days Delay	% of Projects with Payment Delay in each Client Category						% of all Projects	
≤ 14	31	17	-	22	4	-	-	16
14 to 30	40	25	15	-	37	10	-	31
30+ to 60	28	58	65	45	56	74	-	46
60+ to 90	-	-	10	22	3	16	-	5
90+ to 120	-	-	10	11	-	-	-	2
120+	1	-	-	-	-	-	-	0
2004	Private Sector	Public Corporation	National Department	Provincial Department	Metropolitan Council	Regional/District Council	Public Private Partnership	

Table 11: Payment delay of consultant's fees for different client categories 2006

Avg. Days Delay	% of Projects with Payment Delay in each Client Category						% of all Projects	
≤ 14	14	10	29	4	-	14	-	9
14 to 30	27	60	14	42	73	35	100	42
30+ to 60	50	30	43	40	27	43	-	40
60+ to 90	5	-	14	10	-	3	-	5
90+ to 120	-	-	-	2	-	-	-	1
120+	4	-	-	2	-	5	-	3
2006	Private Sector	Public Corporation	National Department	Provincial Department	Metropolitan Council	Regional/District Council	Public Private Partnership	

5. DISCUSSION OF THE CLIENTS' SURVEY RESULTS

5.1 Project type and client category distribution of responses received

Tables 12 and 13 provide a summary of the survey forms completed by clients for projects completed in 2004 and 2006 respectively. The number of survey forms completed is indicated for different client categories and project types.

It is clear from both tables that the majority of results were for civil works and non-residential building projects. For projects completed in 2006 the civil and non-residential projects represent 50% and 30% of all results respectively. The results in this report are therefore presented per project type and per client category to ensure that the results for other project types do not disappear in the average of all projects.

Results for projects from provincial departments represented 38% of all results followed by public corporations (20%) and regional district councils (18%). It is important to note that only two survey forms were received for public private partnership projects and the opinions are thus from only two clients which cannot be considered an average response. The response level is much lower than for the previous survey.

**Table 12: Survey responses received for different project types and client categories
2004**

Project Type	Total No.	24%	5%	15%	6%	43%	6%	1%	% of Total Survey Results
Residential Building	8	4	0	1	1	2	0	0	3%
Non-residential Building	89	43	4	28	8	5	0	1	30%
Construction Works	198	25	11	14	9	121	18	0	67%
	295	72	15	43	18	128	18	1	Total No.
		Private sector	Public Corporation e.g. ESKOM, ACSA	National Department	Provincial Department	Metropolitan Council	Regional / District Council	Public Private Partnership	

**Table 13: Survey responses received for different project types and client categories
2006**

Project Type	Total No.	11%	20%	4%	38%	7%	18%	2%	% of Total Survey Results
Residential Building	4	0	1	0	0	0	3	0	4%
Non-residential Building	34	1	2	2	25	0	3	1	30%
Civil Works	57	4	16	2	13	8	14	0	50%
Mechanical Works	10	6	2	0	1	0	0	1	9%
Electrical Works	2	0	1	1	0	0	0	0	2%
Special Works	6	1	1	0	4	0	0	0	5%
	113	12	23	5	43	8	20	2	Total No.
		Private sector	Public Corporation e.g. ESKOM, ACSA	National Department	Provincial Department	Metropolitan Council	Regional / District Council	Public Private Partnership	

5.2 Construction start and completion milestone dates

Tables 14 and 15 show the actual project start and completion milestone dates achieved for projects completed in 2004 and 2006 respectively.

It is alarming that there was a dramatic decrease from 86% to 65% of all projects starting on time if the 2004 and 2006 results are compared. It is not known if the reason was contractors who could not produce their guarantees on time or the clients who did not have the sites ready to hand over to the contractors.

Table 15 shows that only 34% of all projects completed in 2006 were completed on time with 0% residential building projects and only 25% of civil projects completed on time. It is alarming that there was a dramatic decrease from 80% to 34% of all projects completed on time if the 2004 and 2006 results are compared. It is not known if the reason for this is lack of contractor capacity, managerial skills, finances, know-how or perhaps unrealistic construction periods specified by consultants or clients. This has serious implications on effective service delivery.

Table 14: Project start & completion milestone dates achieved % 2004

Project Type	Start on time	Finish on time
Residential Building	86	71
Non-residential Building	81	77
Construction Work	89	81
Overall 2004	86	80

Table 15: Project start & completion milestone dates achieved % 2006

Project Type	Start on time	Finish on time
Residential Building	100	0
Non-residential Building	51	42
Civil Works	71	25
Mechanical Works	50	50
Special Works	100	67
Overall 2006	65	34

5.3 Construction cost overspending

Tables 16 and 17 show the construction cost overspending for projects completed in 2004 and 2006 respectively. The percentage overspending (+) was calculated as follows. The sum of the tender values of all projects of a specific project type and for a specific client category was calculated. In a similar way the sum of the practical completion values of this group of projects was calculated and expressed as a percentage of the total tender value of the particular group of projects.

Table 17 shows that for projects completed in 2006 the private sector overspent 32% on civil works projects that is a large increase compared to construction works in the 2004 year. The overspending of 14.6% by national departments on residential building projects in 2004 was eliminated in 2006. The provincial departments experienced an increase in overspending on non-residential building projects as well as on civil works projects if civil works are compared with construction works in 2004.

There was also an increase in overspending on residential and non-residential building projects of regional / district councils if Tables 16 and 17 is compared.

Table 16: Project construction cost overspending 2004

Project Type	% Overspending in terms of tender value of total group						
Residential Building	1,6	-	14,6	0	0	-	-
Non-residential Building	0	-0,8	-1,5	8,1	-3,4	-	0
Construction Works	-0,6	1,1	0,1	5,9	4,4	6,6	-
2004	Private sector	Public Corporation e.g. ESKOM, ACSA	National Department	Provincial Department	Metropolitan Council	Regional / District Council	Public Private Partnership

Table 17: Project construction cost overspending 2006

Project Type	% Overspending in terms of tender value of total group						
Residential Building	1,8	-4,1	-	-	-	14,1	-
Non-residential Building	0,2	4,3	-1,2	12,2	-	21,2	0,0
Civil Works	31,9	7,0	0	11,2	-1,1	-2,3	-
Mechanical Works	-2,5	-	-	2,9	-	-	-
Electrical Works	-	5,6	-	-	-	-	-
Special Works	1,0	-12,1	2,4	-2,1	-	-	-
2006	Private sector	Public Corporation e.g. ESKOM, ACSA	National Department	Provincial Department	Metropolitan Council	Regional / District Council	Public Private Partnership

5.4 Customer satisfaction

Table 18 shows the average level of client satisfaction for different project types completed in 2006. These are the performance levels of the consultants, contractors and the quality of materials used.

Table 18: Customer satisfaction 2006

Project Type	Clients' Level of Satisfaction with %						
Residential Building	92	80	-	80	80	80	-
Non-residential Building	80	83	82	83	83	84	83
Civil Works	73	75	73	73	77	76	79
Mechanical Works	87	90	90	90	90	80	90
Electrical Works	80	80	-	80	-	-	80
Special Works	89	89	90	88	83	80	85
2006	Overall performance of Consultants	Overall performance of Contractor	Ability of Main Contractor to finish on time	Quality of Completed Work	Main Contractor's Resolution of Defective Work	Work Defect free at Practical Completion	Overall quality of Materials used

The civil works projects received throughout the lowest satisfaction level varying from 73% to 79%. This score is still satisfactory. The results indicate that the clients are on average satisfied with their consultants and contractors and the quality of materials used.

6. SUMMARY AND CONCLUSIONS

The cidb CIIs measure the performance of the South African construction industry by measuring client, consultant and contractor satisfaction. This paper reports on the client satisfaction as measured by the project milestone dates achieved, construction costs versus budget, contractors' performance, consultants' performance, and the quality of materials used. The consultants' responses provided information on the procurement indicators. These include contractor performance issues utilised in the adjudication of tenders, the type of procurement procedure used, and the contracting strategy adopted. Compliance with the cidb's Standard for Uniformity intervention regarding allowable forms of contract was also measured.

The CII's focus on critical aspects of project outputs or outcomes. The systematic use of CIIs is essential as the value of CIIs is almost completely derived from their consistent use over a number of projects. Data collection must be as simple as possible and a large sample size is required to reduce the impact of project specific variables.

It was found from this survey that only 65% of all the projects commenced on time. This is likely due to the fact that contractors could not produce their guarantees on time. Only 34% of all the projects were completed on time. This seriously hampers governments' delivery goals.

Client bodies were generally speaking satisfied with the performance of their contractors and consultants and with the quality of materials used.

Only 6% to 9% of public sector projects were still only adjudicated on price alone. This shows that governments BEE procurement policies are implemented throughout. There is a growth in the use of price, preference as well as functionality in the adjudication of tenders that is a good sign as a good contractor track record should be promoted.

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APPROPRIATE SKILLS FOR PROJECT MANAGEMENT SYSTEM AND ITS ADOPTION IN THE TANZANIAN CONSTRUCTION SECTOR

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ABSTRACT

Purpose of the study

Project management system allows the introduction of the project manager who is the client's consultant with the roles of coordinating the activities of all parties involved in the project. This research examines skills necessary for the project management system and the extent to which the system has been used in the Tanzanian construction sector.

Design/methodology/approach

Questionnaires and interviews were used to collect information and total of 45 questionnaires were generated, 37 questionnaires returned and 13 interviews were conducted. The results were analyzed and presented by using Microsoft excel and word using the tables and charts.

Findings

Findings revealed that project management is fairly know but not practiced and only 27% of the respondents have practiced the system and also the system lacks institutional support. Majority of staff in firms offering project management services in Tanzania are graduates with technical skills mainly in architecture, engineering and quantity surveying and little skills in management. It was also found that appropriate skills for proper project management are contract administration, construction economics and general management

Practical implications

It is therefore recommended that there is a need to establish Registration Board of Project Managers which will address, regulate and protect the services of project managers.

Keywords: Project management, skills, construction sector

1. INTRODUCTION

Execution of construction contracts involves interaction of several activities sometimes carried out by various parties including client / developer, design teams, consultants, contractors, suppliers and sometimes manufacturers which consume a lot of resources within specified span of time. Successful execution and completion of any contract would require scientific coordination of activities, parties carrying out the activities and the several resources involved. Project management delivery system in construction has been described as the planning, control and coordination of a project from inception to completion on behalf of a client. It is concerned with the identification of the client's objectives in terms of utility, function, quality, time, cost and establishment of relationship between resources (Willis et al., 1994). PMBOK (2000) describes project management as the application of knowledge, skills, tools and techniques to project activities to meet project goals. The coordination of the activities can be done by a separate consultant who is entirely devoted to management of the project. Franks (1984) states that there is a need for someone to manage the project as a separate distinct member of the construction team, a project manager. The person appointed to the project management function must have good knowledge of design procedures, construction economics and construction methods (ibid.)

Most of construction projects in Tanzania use traditional system which does not provide checks and balance to each project participants (Mbatha, 1996 and Kikwasi, 1999). This was also disclosed by Rwelamila (2007) that Tanzania construction industry like other commonwealth countries predominantly uses the traditional project delivery system in procuring goods and services. As a result projects tend to increase in cost, time and are of poor quality. There is a little understanding of the existence of the project management system in the industry from the stakeholders such as clients and even some consultants and the government itself (Mbatha, 1996). The reasons are the overriding of traditional system and resistance from the architects or engineers on adoption of the system. Despite alternative procurement systems being known, various practitioners are not clear of the advantage of these procurement systems over the traditional system (Kikwasi, 1999). Few clients in Tanzania who have adopted project management system in executing their projects have never gone back to traditional procurement system. These include National Assembly (NA), National Examination Council of Tanzania (NECTA), Bank of Tanzania (BOT) and National Social Security Fund (NSSF).

Most of the firms or individuals practicing project management have broadly, developed from backgrounds like architecture, engineering, quantity surveying and property development. Rwelamila (2007) argues that technical expertise in architecture, engineering, quantity surveying and construction management is not the only most important requirement for successfully project management. Construction technical expertise is necessary on the project core team but not necessary for the project manager. Based on the above argument any construction expert who wants to become a construction project manager should attend project management courses. To practice as a project manager one must possess appropriate skills. This paper discusses skills of project manager into two main categories; technical (hard) skills and social-culture (soft) skills as classified by Rwelamila (2007). Project management in the broad sense, that is, from the perspective that any type of project such as industrial assembly line, new construction, or technology implementation is operated by the same sets of rules and processes. Walker (2002) notes that project managers are a very special breed of people; they are much in demand and will be increasing so as the need for effective technologists continue to soar. Some project managers prefer to have little technical knowledge about the projects preferring to leave the technical management to other junior managers, such as engineer, quantity surveyors or programme managers under them. Others have detailed technical skills of computer languages, software, and networks.

According to Mbatha (1996) and CIOB (2002) project managers should be familiar with economics of construction such as prices and costs of various resources needed in the project, currency and inflation, capital and the life cycle cost studies of alternative designs and materials. Project managers also should advise the client on appropriate procedures for dealing with insurance claims and agree any changes required to consultants fee arrangements generated by them (ibid.) CIOB (2002) and Ramus (1989) describe that a project manager has to deal with all matters associated with contract management which include forms of contract for consultants and contractors / sub-contractors; works carried out under separate direct contract' procedures for contractors' / sub-contractors' selection and appointment; check list for design team members and consultants meeting their supervisory and contractual obligations; the placement of orders for long delivery components; and the preparation of contract documents. On the other hand project manager need other skills called personal or social-culture skills (PMBOK, 2000; Rwelamila, 2007) such as managerial skills, communication, and business skills. Nevertheless, project managers develop skills through experience and education. They become better project managers each time they successfully deliver a project. They learn new techniques and apply them on their projects.

2. RESEARCH METHODOLOGY

Probability sampling was used to gather information from consultants and contractors. Lists of registered consultants and contractors were obtained from respective registration boards. Non-probability approach was employed to collect information from the clients and project managers since they are a small group. Consultants selected are those who offer project management services or project planning. Contractors selected are those registered in class one local and foreign firms which have been doing construction works for more than ten years. Project managers in this case are those who have been practicing project management in the past and on going projects. Clients are those public organizations which have several construction projects and construction technical staff.

Questionnaires were constructed using *rating scales, close-ended questions and open-ended questions*. Interviews were conducted through structured questionnaires with clients' officials, consultants, contractors and project managers. A total of 45 questionnaires were generated, 37 questionnaires returned and 13 interviews were conducted. The results are presented according to the order of questions formulated. The tools employed in data analysis are Microsoft excel and word. Data are presented by using the tables and charts. All data from clients, consultants, project managers and contractors were combined during analysis. Data from interviews were used to supplement the data from questionnaires.

3. FINDINGS

3.1 Experience in the Construction Industry

It was found that clients in this category have departments or directorates dealing with planning, co-ordinating and sometimes supervising construction activities. These include projects funded by ministries and organizations or projects funded / sponsored through them. The employees of these departments were architects, engineers and quantity surveyors.

Findings show that most of the clients, consultants, project managers and contractors are in the industry for a long time. 78% of the respondents have experience of more than ten years. For project managers, 20% have over 10 years experience in the industry while 40% have experience ranging from two to five years. The table below illustrates the experience of respondents.

Table 3.1: Experience of respondents

S/n	Range in yrs	Cls	Arcs	QSs	Engs	PMs	Contr	T	% age
1	Less than 1yr								
2	2 -5 yrs					2		2	5.4
3	5-10 yrs		2	1	1	2		6	16.2%
4	Over ten years	5	4	5	4	1	10	29	78.4%
	Total	5	6	6	5	5	10	37	

Cls = Clients Arcs=Architects QSs =Quantity Surveyors M = Mean
 Engs = Engineers PMs = Project Managers Contr = Contractors

3.2 Project Delivery Systems Commonly Used

Seven project delivery methods were listed namely traditional, design and build, build operate and transfer, management contracting, project management, construction management and turnkey. Responses show that traditional procurement system scores the highest as 68% use this approach. Also 40% of the responses from project managers indicate that they are using traditional procurement system. Findings from the clients show that traditional procurement system is leading and was found widely adopted in the Ministry of Health and Social Welfare (MOHSW), Ministry of Education and Vocational Training (MOEVT), and Ministry of Agriculture and Cooperative (MOAC). Nonetheless, Tanzania National Roads Agency (TANROADS) was found using alternative project delivery systems in executing its projects. These include design and build method for construction of Mingoyo – Mbwemkuru, Nakururu –Mbwemkuru and Manyoni – Singida roads and management contracting in construction of Dodoma – Manyoni road. Although the agency is using alternative project delivery systems, none of its project had used the project management delivery system. On the other hand, NSSF is using the services of a project manager in its construction projects. This is evident in the construction of a hostel for students of the University of Dar es salaam at Mabibo, renovation of Water Font building (former NASACO) building, construction of new Parliamentary building at Dodoma and the on going construction of the Institute of Social Works and Humanity at Dodoma University. These results suggest that traditional procurement system is dominant in the industry and adoption of project management is still far back in its application. Results are shown on Table 3.2 below.

Table 3.2 Project delivery systems commonly used

S/n	Range in Years	Cls	Arcs	QSS	Engs	PMs	Contr	T	% age
1	Traditional	3	5	4	3	2	8	25	67.6
2	Design and build				1			1	2.7
3	Management contracting	1						1	2.7
4	Project management	1	1	2	1	3	2	10	27
5	Construction management								
6	Turnkey								
7	Variant of Design & Build								
	Total	5	6	6	5	5	10	37	

Cls = Clients Arcs=Architects QSS=Quantity Surveyors T = Total
Engs = Engineers PMs = Project Managers Contr = Contractors

3.3 Awareness and Practice of the Project Management Delivery System

The results show that all respondents from clients to contractors are aware of project management delivery system. Some of them had practised the system although with a very few number of projects normally less than 5. That means project management is well known by the professionals but it is rarely used. Findings from the clients show that most of the ministries use traditional project delivery system but for agencies like TANROADS and parastatals such as NSSF which are semi – autonomy organizations are using different options. An official from one of the ministries said that although they are aware of project management, it is very difficult to be adopted because the boss, the Permanent Secretary has little knowledge on the system and sees a project manager as additional costs to the project. Another official from another ministry said that, even if within the organization there is a person (s) who can be assigned a role of project manager; there is a sense of selfishness among workers as they think this will give somebody personal benefits. Another claim from the official who had worked as a project manager in one of the projects funded by the ministry is that the task to coordinate the works is given with no job description or authority. He added that in some instances project architects and other consultants have a direct communication with the client, and some of the decisions are made by the client without involving the project manager. At the end of the day the project manager remains as a desk officer.

There was also another opinion that construction project managers are not well known. In most cases people know architects, engineers and recently quantity surveyors and their regulatory bodies and associations, unlike project managers who have no official body to regulate their services. In general the findings show that clients need to be educated about project management. Table 3.3 summarizes the responses on the awareness and practice of project management system.

Table 3.3 Awareness and practice of project management system

S/n	Awareness	Cls	Arcs	Qs	Engs	Contr	T	% age
1	Aware and practice	1	1	2	1	3	9	24
2	Aware but not practice	1	4	3	4	9	24	65
3	Not aware	4					4	11

Cls = Clients Arcs=Architects Qs =Quantity Surveyors T = Total
Engs = Engineers Contr = Contractors

Results show that 65% of the clients, consultants, project managers and contractors are aware of project management but they are not practicing.

3.4 Appropriate Stage for Engaging a Project Manager

Seven stages of construction were listed namely inception, briefing, designing, tendering, construction, commissioning and maintenance for respondents to choose the appropriate stage to engage the project manager. Majority of respondents (62%) suggest the appropriate time for engaging a project is at the inception stage, followed by designing and construction stage 11% each. Contractors have different opinions as they say project manager can be engaged at any time and preferred at construction stage so long he / she knows what to do and has enough authority.

3.5 Challenges Facing the Adoption of Project Management System

Some of the challenges facing the adoption of the project management system in Tanzania construction projects were listed. These are; domination of traditional system, lack of understanding of the project management system by clients, additional fee to the project i.e. fee for engaging a project manager, lack of professional / trained project managers, lack of standard form of project management system and attitude of personnel involved in the project management. Respondents had to rank on a 5 point scale, 1 being the most serious and 5 the least and the results is show on Table 3.5

Table 3.5 Challenges facing adoption of project management system

S/n	Awareness	Cls	Arcs	Qs	Engs	PMs	Contr	M
1	Domination of traditional system	2	2.5	2.4	2.3	1.8	2.6	2.3
2	Lack of understanding of project management to clients	1.5	1.7	1.4	2.2	1.6	2.2	1.8
3	Additional fee structure to project.	1.8	3.5	3.2	3.2	3.3	2.6	2.9
4	Lack of trained project manager	3.2	1.9	3.0	2.2	4.0	2.2	2.8
5	Lack of standard form	2.5	2.7	3.6	3.2	2.8	3.7	3.1
6	Attitude of project managers	3.8	4.2	4.6	3.8	4.4	2.8	3.9

Cls = Clients **Arcs**=Architects **Qs** =Quantity Surveyors **M** = Mean
Engs = Engineers **PMs** = Project Managers **Contr** = Contractors

The results show that lack of understanding of the project management system by stakeholders such as clients is a big challenge with the average mean score of 1.8, followed by domination of the traditional procurement system (mean score = 2.3). Lack of trained project managers ranked the third with 2.8 mean score. Attitude of the project managers ranked the least with a mean score of 3.9. There was also a concern on how architects and engineers, who in most cases are the leading consultants, presume the role of project manager in the projects. The response from project managers show that in some cases during site meetings or design meetings architects tend to maintain superiority and take the authority of the project manager. Lack of strong association / regulatory board to advocate, regulate and protect the rights and services of project managers, might have lead to the project management system in our country being marginalized.

3.6 Appropriate Skills a Project Manager Should Posses

Technical and social skills were listed for assessment which included; communication skills, construction economics, managerial, contract administration, business management, project planning, construction technology (i.e. methods and materials), human resource management, leadership and any other skills which the respondents believe are important for the project manager. The aggregated responses of all respondents from consultants, project managers and contractors are shown in Table 3.1.

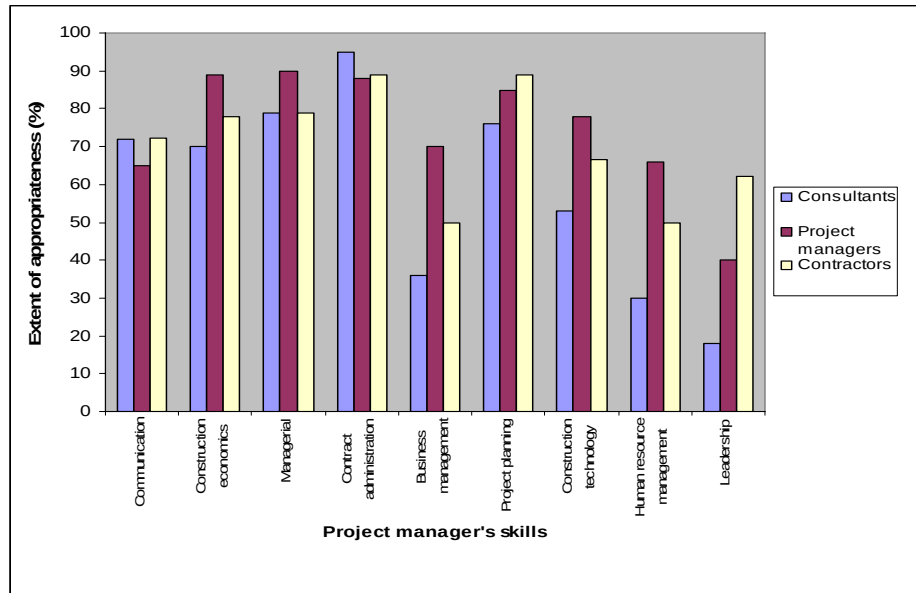


Figure 3.1 Skills appropriate for project managers

Results reveal that contract administration scored the highest with 91% followed by construction project planning and general managerial skills 83% and Construction economics 79% and Leadership scored the least (40%). This result suggests that a project manager should possess both technical and social skills for better performance. However, most preferred skills are contract administration, project planning, managerial and construction economics skills.

3.7 Skills of the Firms Offering Project Management Services

After evaluating appropriate skills of the project managers from consultants, contractors and project managers, consulting firms which offer project management services and project managers were assessed in terms of number of staff employed and their skills. Skills were listed under three categories namely; postgraduate level, graduate level and those acquired through short courses. Under postgraduate skills findings indicate that engineering management score the highest (41%) followed by business administration with 32% and project management 23%. The least was construction management (4%). These results suggest that the industry is still in need of skills on project management at this level. Furthermore, skills available at these levels are mainly possessed by senior staff (Directors) of the firms, who are who spend most of their time managing firms and not projects.

Under graduate category, responses indicate that most of the practitioners are trained in construction technology (42%), followed by construction management (31%) and the last is construction economics (26%). The analysis shows that most of practitioners got skills in construction technology and construction management as well as construction economics as a subject in engineering, architectural or quantity surveying fields and not as full dose courses. But the major concern remains, can these skills be adequate for a project manager?

Table 3.7 Training of project managers through short courses

S/No	Short courses	Arcs	Engs	Qs	PMs	T	% age
1	leadership	1			4	5	15
2	Contract administration	3	3	4	5	15	46
3	Human resources management	1		1		2	6
4	Project planning and administration	3	5	1	2	11	33
	Total	8	8	6	11	33	

Responses indicate that skills on contract administration and project planning scored 46% and 33% respectively. Furthermore, only 15% and 6% of staff have attended leadership and human resources short courses respectively. However, findings show that there was no single junior staff who attended these courses. The reason given is that their firms do not pay attention to train their staff. Such courses have been offered by National Construction Council (NCC) and National Institute of Productivity (NIP) but the problem is the fee for the courses which is claimed to be too high for them to afford and some times their bosses do not allow them to attend.

4. CONCLUSION

Alternative procurement systems have been in existence in the construction sector but their adoption at large has been at a low profile. Project management is fairly know but not practiced and only 27% of the respondents have practiced the system. The system lack institutional support to regulate, address and protect the interest of the services of project managers. Majority of staff in firms offering project management services in Tanzania have most of their staff possessing technical skills mainly in architecture, engineering and quantity surveying and little skills in management.

Directors who possess managerial skills through pursuing postgraduate courses or attending short courses on management spend most of their time in managing firms. It was also found that appropriate skills for proper project management are: contract administration, construction economics and general management.

It was also revealed that major challenges facing the adoption of the system include: project management as well as project managers' deployment in construction projects is not well known by clients; traditional system override other construction projects delivery systems; architects and engineers in the country have been acting as project managers and are not ready to advise the client to adopt the system

5. RECOMMENDATIONS

In view of the findings, there is a need to establish a regulatory body to promote, regulate and protect the interest of those who are practicing as project managers. Firms offering project management services should strive to employ staff who have appropriate skills or sponsor their staff to attend short courses in management. This will enhance their capability in offering services enable them to compete with other practitioners in the industry through demonstrating their capabilities.

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CONSTRUCTION PUBLIC CLIENT HEALTH AND SAFETY CULTURE IN BOTSWANA: A PILOT STUDY

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ABSTRACT

Purpose of this paper

This paper presents the preliminary findings of an exploratory pilot study into the health and safety culture of public sector clients in Botswana with a view to identifying aspects to be included in a larger broad-based national survey.

Design / Methodology /approach

Structured interviews were conducted with project managers from two major public client organisations in order to explore the commitment of clients to H&S, allocation of resources in terms of H&S, and whether clients were leading by example relative to H&S.

Findings

The pilot study found that *prima facie* the H&S safety culture of the two public clients was not strong when compared against the expected elements of a good H&S culture.

Limitations

The survey was only conducted in two major public clients where senior project managers were interviewed. The results may not be generalised to

all public clients in Botswana. Further, only a few selected elements of the many suggested characteristics of H&S culture were assessed in the study.

Originality / value of this paper

The H&S culture of construction clients or owners has not been extensively explored even though it is widely accepted that the client is very important to H&S performance improvement. The paper contributes to this body of knowledge.

Keywords: Botswana, construction, health and safety culture, public client

1. INTRODUCTION

Even though it is widely accepted that the client is very important to H&S performance improvement, the H&S culture of construction clients or owners has not been extensively explored. For the purposes of this particular paper, the terms 'client' and 'owner' have been used interchangeably to refer to one and the same entity. Typically they are the initiators of projects and purchasers of the products of construction (Lingard, Blismas, Cooke and Cooper, 2008). However, there are several types of clients and categorisation may take various forms. One such categorisation is that which identifies a client to be either engaged primarily in the public or private sector (Brook, 2002).

Given that most construction projects in Botswana are executed by public sector clients, it follows therefore that they may be influential on more than half of all construction projects in Botswana. Many researchers affirm that clients can influence H&S on site (Huang and Hinze, 2006; Suraji, 2001 and Smallwood, 1998). Therefore, the H&S culture within client bodies is important since H&S culture has also been identified to have an impact on health and safety goals (CRC, 2006).

However, from evidence in several earlier studies it seems that most clients have not shown serious commitment to H&S. A study conducted by Smallwood (1998) in South Africa found that most clients give priority equally to cost and quality while H&S is largely overlooked. This situation is a challenge to health & safety performance improvement.

A further challenge is the perception that H&S management is primarily the responsibility of contractors despite the emergence in recent times of legislative and regulatory frameworks that redistribute responsibility for construction H&S to all parties involved in the construction process. Interventions such as H&S audits are usually designed only to find risks or hazards at the technical or operational level but less concern at managerial level of the project organisation as a whole. Few strategies are directed at improving upstream elements including those involving clients. H&S campaigns are only made for operatives rather than for those who are

involved during the concept or design phases of a construction project (Suraji et al., 2006).

A review of literature confirms that examination of the role and culture of clients are almost absent from most studies. Concentration is overly placed on the construction phase of projects and the related operational processes of contractors (Saurin et al., 2003; Sawacha et al., 1999; Carder, 2002; Teo et al., 2005 and Hudson, 2001). However, Huang et al. (2006) focused on clients and Lingard et al. (2008) on the development of a model client framework for the Australian Government.

Clients if involved can influence worker health & safety (Huang et al., 2006 and Smallwood, 1998). Using total recordable injury rate (TRIR), to determine the relationship between H&S performance and owner involvement, Huang et al. (2006) demonstrated that clients can influence H&S outcomes. Smallwood (1998) found that most general contractors believed that the client could potentially influence their health and safety performance.

According to Suraji et al. (2006), improving health & safety means to make clients, client representatives, designers and contractors as well as employees to be aware of their roles in the improvement process. Hinze and Gambetese (1996) further argue that involvement of clients is an essential requirement for the zero injuries objective. In fact according to Gambetese (2000), owners should participate with contractors in all project H&S activities.

Bomel (2001) identified the culture of client organisations as presenting considerable opportunities for H&S improvement in the UK construction industry. Improving H&S record has been attributed to an improvement in the H&S culture by many authors (Chinda and Mohammed, 2008; Baram and Schoebel, 2007; Dingsdad, Biggs and Sheahan, 2006; Muniz, Peon and Ordas, 2007 and CRC, 2006).

There has also been an increasing interest in the subject of safety culture primarily because of its impact on health and safety outcomes. As a result many definitions of the concept have emerged. A number of authors however agree that there is no unanimity on the definition of the concept of H&S culture (Muniz et al., 2007; Hopkins, 2006 and Cooper, 2000). According to Cooper (2000), H&S culture does not operate in a vacuum. Rather it affects and is affected by other non-H&S related operational processes or organisational systems. For the purpose of this paper and study H&S culture describes the H&S beliefs, values and attitudes that are shared by the majority of people within an organisation (Muniz et al., 2007; CRC, 2006; Australian Government, 2008; Molenaar et al., 2002 and Cooper, 2000). This definition is also summed up by 'the way we do things here' (Cooper, 2000: 115).

There has been debate not only around the definition of the safety culture concept, but also its measurement. However, according to Cooper (2000) it is "that observable degree of effort with which all organisational members direct their attention and actions towards improving safety on a

daily basis". The units of 'effort' differ and could be the degree to which members give priority to H&S over production. Outcomes of a positive health & safety culture could be a reduction in injury rates. However as Cooper (2000) points out, reductions in injury rates although very important, are not sufficient in themselves to indicate the presence or quality of a H&S culture, where as "that observable degree of effort" is something that can always be measured and assessed.

This paper focuses on commitment to health & safety, allocation of resources and leading by example. In other words, the assessment of "that observable degree of effort". The paper also focuses on establishing the existence of shared values between senior project managers in client organisations.

2. RESEARCH METHODOLOGY

A structured questionnaire was used to conduct interviews with representatives at two public construction client organisations. This approach was followed to improve consistency in the responses and ease of analysis. The method was also considered appropriate for a pilot study. In the next phase of the study a Delphi approach will be followed.

2.1 Profile of sample

Four project managers from each of the two major public client organisations were interviewed given that they had access to information on policies and their responses on their practices on health & safety would shade light on the way things were done in their organisations. These two public clients, namely X and Y, were selected because they were recurrent clients of constructed facilities together each taking a third largest percentage of the developmental budgetary allocation. Almost 12% of the developmental budget was allocated in the 2009/10 budget to them. They were also directly involved in the management of their construction projects across Botswana. Most responses to the questions were based on five point Likert rating scales of agreement or importance.

The generalization of the findings of the study to the entire Botswana construction client sector is limited taking account of the small sample size. However, considering the market share of the selected clients the findings are indicative of what the likely trends might be and the issues that need to be examined more closely in the next phase of this study.

3. FINDINGS

3.1 Client commitment to Health and safety management

Participants were asked about how often they implemented various health & safety elements, namely:

- Appraising designs in terms of health & safety;
- Attending health & safety specific meetings on construction projects; and
- Conducting health & safety audits.

Responses on whether both client organisations appraised designs in terms of health & safety revealed that this was not frequently done in both organisations. In client organisation X, half of the interviewees reported that designs were 'rarely' appraised in terms of health and safety while the rest reported appraisal was done 'sometimes' (Table 1.0).

Table 1.0 Appraising of designs

Entity	Response (%)				
	Never	Rarely	Sometimes	Often	Always
Client organisation X	0	50	50	0	0
Client organisation Y	25	25	50	0	0

As to whether clients attended health & safety specific meetings on construction projects, participants responded similarly, namely that clients 'rarely' attended these meetings. Half of the interviewees from public client X indicated that meeting attendance occurred 'rarely' while all except one from public client Y reported that they 'rarely' attended such meetings (Table 2.0).

Table 2.0 Attending health and safety meetings

Entity	Response (%)				
	Never	Rarely	Sometimes	Often	Always
Client organisation X	0	50	25	0	25
Client organisation Y	0	75	25	0	0

In client organisation X, responses from half of the interviewees were that clients conducted health and safety audits 'sometimes' with the rest reporting that health and safety audits were either 'rarely' or 'never' done.

This finding was echoed in client organisation Y with 75% reporting that they 'rarely' conducted health and safety audits.

3.2 Allocation of resources and client leading by example

Allocation of resources was assessed through questions on the importance of H&S compared to other contract parameters such as tender sum, completion period and bidder experience, as well as through questions on client activities on health & safety such as conducting audits and general involvement. Responses show that health & safety was probably not as important as other parameters in contract award decisions. Both client organisations identified tender sum, construction period and previous experience of bidder as being more important than health and safety. The above parameters were regarded as 'very important' by all interviewees from both client organisations. Health and safety was considered to be of 'low importance' by slightly over 60% of respondents (Table 3.0).

Table 3.0 Importance of parameters to contract award

Entity	Response (%) (level of importance. 1 = Very low importance & 5 = very important)					Importance index	Rank
	1	2	3	4	5		
Construction period	0	0	0	12.5	87.5	3.88	2
Bidder experience	0	0	0	50	50	3.50	3
Bidder's H&S record	12.5	12.5	25	37.5	12.5	2.25	4
Tender sum	0	0	0	0	100	4	1

3.3 Shared value of health and safety

Assessment of the shared value of health and safety was another important aspect that was examined through questions about practices in the organisations and the management of health and safety.

In particular responses were sought relative to the following:

- Whether clients should be obliged to pay for ensuring health and safety on construction projects;
- Whether health and safety should be a primary responsibility of either contractors, clients or designers; and
- Whether revision of legislation would make client organisations responsible for the management of health and safety.

These issues generated varied responses suggesting a lack of a common principle or background in both organisations. Relative to whether clients

should pay for ensuring health and safety, responses ranged equally from 'strongly agreeing' and to 'disagreeing' with the idea. Combined responses across the two organizations were that 25% 'strongly agreed', 12^{1/2}% were 'not sure', 25% 'disagreed' and the remaining 12^{1/2}% 'strongly disagreed' with the idea (Table 4.0). Similarly combined responses from both client organisations were that 37^{1/2}% 'strongly agreed', an equal percentage 'agreed with the idea whilst 12^{1/2}% 'disagreed' and the other 12^{1/2}% 'strongly disagreed' whether health and safety should be a primary responsibility of either clients, contractors, designers or indeed be equally shared between all of them. There was strong full agreement in client organisation X on the client being more responsible for health and safety. In client organisation Y however, only half 'agreed' while the other half 'disagreed' with the idea. Similar results were obtained on responses regarding whether designers should be more responsible for health and safety. There was however a general agreement that all parties should be involved in the management of health and safety although not so emphatic as on other aspects where there was a strong agreement. Between the two client organisations, responses from 75% of the interviewees 'agreed' that all parties must be responsible for ensuring health and safety on construction sites (Table 5.0).

Table 4.0 Clients paying for health and safety

Entity	Response (%)				
	Strongly agree	Agree	Not sure	Disagree	Strongly disagree
Client organisation X	25	25	0	25	25
Client organisation Y	25	25	25	25	0

Table 5.0 Health and safety responsibility

Entity	Response (%)						Rank
	Strongly agree	Agree	Not sure	Disagree	Strongly disagree	Ranking index	
More responsibility to:							
Clients	50	25	0	12.5	12.5	2.88	2
Contractors	37.5	37.5	0	12.5	12.5	2.75	3
Designers	25	25		25	25	2.00	4
All parties	50	25	12.5	12.5	0	3.12	1

4. DISCUSSION

Most research has shown that health & safety on construction sites is influenced by factors that may be remote to it. Management commitment, designer influence and to some extent client influence have been suggested as precursors to health & safety problems on construction sites.

This pilot study explored using a small sample, the construction public clients' health & safety culture by evaluating two public clients' commitment to health and safety management, whether they led by example and also whether there was a shared value of health and safety among project managers from the two organisations. Responses on clients' commitment to health and safety seem to suggest a low to medium level of participation in the management of health and safety. Health and safety audits and attendance of health and safety specific meetings are rarely done. Equally, designs are not frequently appraised in terms of health and safety. It is argued that in an organisation where there is a strong health and safety culture, the above 'efforts' are supposed to be basic routine activities.

The responses from the interviewees also suggest that both client organisations may not actually have documented policies and protocol on health and safety management. The argument again is that, in an organisation where policies and protocols are documented or are generally agreed and accepted as a norm, the above basic procedures to manage health and safety could have been established as a basic requirement.

On the aspect of allocation of resources, responses on leading questions seem to suggest that inadequate resources are allocated to the management of health of safety by both clients.

In comparison to other parameters of construction projects such as tender sum, construction period and experience of tenderers, health & safety was hardly considered during the awarding of contracts. Health and safety is considered to be of least importance in deciding on which contractor should be awarded the contract. One would argue therefore that since health and safety is not regarded as important in comparison to other parameters, it follows therefore that even the allocation of resources would be commensurate with the importance that has been placed on the element.

This argument can be supported by the earlier suggestion that it seems both clients may not have documented policies and protocol on health & safety and therefore it is unlikely that resources may be allocated to an unidentified or unplanned for activity, in this case being health and safety.

The findings are suggestive of possible lack of leadership by public client organisations on health & safety since both clients' level of involvement in health & safety was low.

As to whether clients led by example on health and safety management, responses reveal a low involvement in health and safety management and as well as having a low regard for health and safety.

Responses also seem to indicate a lack of a shared value of health and safety in both public client organisations. It seems both organisations do not have policies and protocols in place to guide and shape their values on health and safety.

5. CONCLUSION

Literature informs that clients or owners can influence health & safety on construction sites. It is suggested in this paper that clients' health & safety culture is important to the industry's health & safety performance. A pilot study was conducted and identified that there was low commitment to health and safety, an inequitable allocation of resources to ensure health and safety improvement, a lack of leadership and a lack of shared value of health & safety in both client organisations. These findings suggest that health & safety improvement effort needs to focus on client organisations especially public clients. More research should also be focused at improving clients' health and safety culture.

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DIMENSIONS OF CONSTRUCTION MANAGEMENT MATURITY AND DEVELOPMENT TOWARDS A LEARNED SOCIETY

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ABSTRACT

Purpose

The Initiative of this study was to identify the dimensions that are important determinants in establishing and developing the level of maturity of a profession. In this case, specifically the construction management society in a specific nation or economy and the maturity level of the profession.

Design

A questionnaire based on previous research results (research on project management and quantity surveying maturity, done by the University of the Free State) was compiled to identify the most important dimensions of a mature construction management learned society. As a first phase of the survey, some identified imminent contractors, construction managers and quantity surveyors in South Africa, were requested to evaluate these dimensions according to the level of importance of each. Development work done by the industry and academic institutions also contributed to the study. The following dimensions were selected and used for this study: education, training, mentorship, continuing professional development (CPD), research, marketing, infrastructure, law & regulations, standardisation, management practices and total quality management. A weighting of these dimensions was used to propose a maturity model for construction management.

Results

The dimensions that are perceived to be substantially important for a mature construction management society are proposed. A maturity model for the construction management profession as a learned society is shown.

Value

Based on the analysis of the identified important dimensions, a unique model may be proposed for implementation for construction management, thus adding value to the understanding of the profession's maturity.

Key words: Learned society, mature profession, strategic positioning, maturity model, construction management

1. INTRODUCTION

Nations, regions, industries, companies and associations are continuously striving to become 'world class'. This is also true about the construction management profession. The problem: Is the profession a learned mature society? This can possibly be answered by evaluating different maturity models (see Figure 1 and Figure 2) that are required for analysing the maturities of different social systems. The competences required by a company, a nation or society depend on its context (Gasse, 2006: Online).

The Project Management Group of the Wirtschafts University, Vienna, Austria initiated the research programme: *Project orientation [international]* at the beginning of 2005. The objective of the research programme was to analyse and benchmark about 350 project-oriented companies in about 15 project-oriented nations. The models were based on the project-oriented company and management in a project-oriented society or nation. It therefore also addressed the most important elements of a project oriented nation referred to in Figure 2, in this instance reflecting South Africa. The results gained may lead to strategies on how to further develop maturity models, identified during the study, for the construction management profession (Project Management Group, 2006). This project was concluded in 2007 and of the original 15 nations, seven nations results / data were published in the final report (Project Management Group, 2007).

Maturity may be defined in many ways, but for the purpose of the paper, the International Research Group's definition was used, whereby 'A maturity model is seen as a framework describing or showing a process, enabling the development of a desirable outcome' (Gruber, 2004).

Project management maturity does not relate to function or knowledge only, but is an integrated system dependent on a total measurable profile. (Verster & Hauptfleisch, 2007).

The project management maturity model was used as a guide to propose a construction management model. This is a generic model and may equally be applicable to construction project management. Project-oriented companies, organisations, enterprises or nations have specific strategies, structures and cultures. A maturity model may thus be divided into dimensions or processes and sub-dimensions. Various weights are allocated to the dimensions to indicate the importance of a specific

dimension (Gareis, 2005: 32). This is analysed in a project-orientation maturity model. Figure 1 indicates the eight dimensions (processes) applicable in respect of a project oriented company (Project Management Group, 2007).

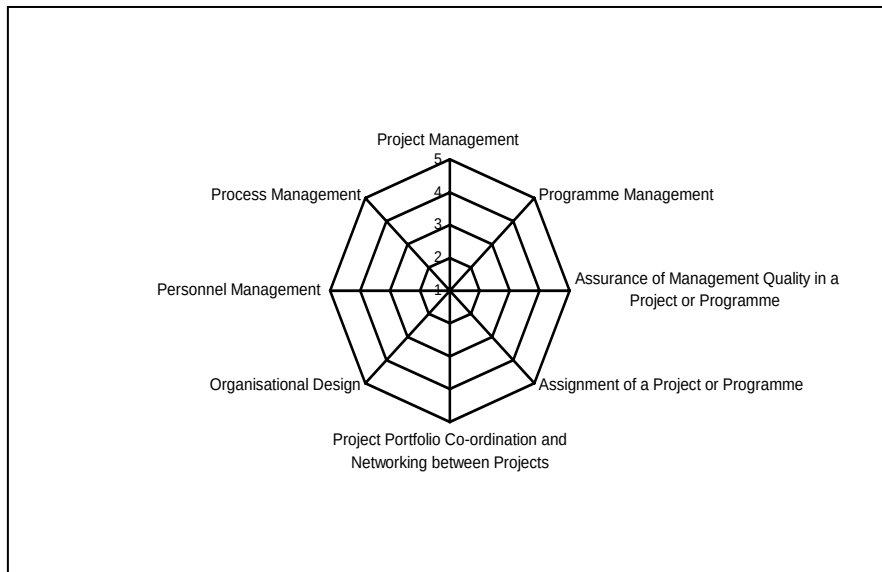


Figure 1: Maturity Model for a Company

Source: Project Management Group (International), 2007: 15

This model was used as a viable structure to identify the most important dimensions of the mature learned societies of construction managers and quantity surveyors. This maturity model was used by the International Research Group as the model to base the research upon; this project is an extension of the research project.

An organisation and or company operate in a bigger system defined as a nation or society / association. Figure 1 shows the eight dimensions for company maturity, but maturity modelling also aims at providing an understanding of the maturity of a project-oriented nation.

Fuessinger (2006: 3-4) proposes that the maturity of a project-oriented nation should also include the following additional project-management related services:

- **Education** - Formal education programmes are provided
- **Research** - Research projects, publications and events
- **Marketing** - A national project management (professional) association (and it's activities)

The Figure 2 spider web model shows the average project management maturities of South Africa in respect of the results obtained from the survey described above and the 10 dimensions which include the above three dimensions. This served as an example to establish a foundation for identifying the dimensions of a construction management profession maturity model.

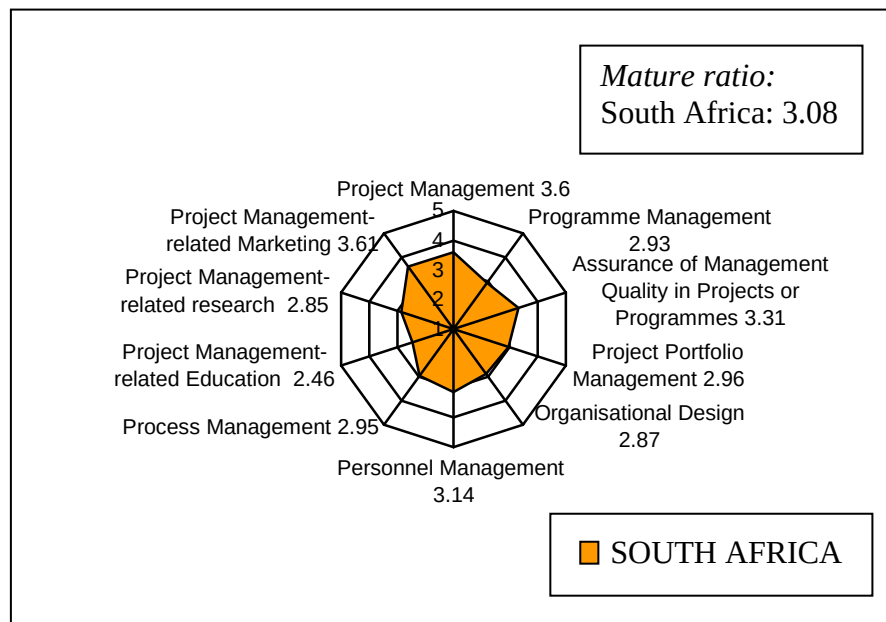


Figure 2: South Africa as project-orientated nation

Source: Project Management Group (International), 2007: 58

The average project management maturity ratio, including the three dimensions of education, research and marketing of a mature nation, for South Africa is 61.6%. South Africa shows a high maturity ratio in Project Management at 72%. Organisational Design (57%) and Project Management related Education (49%) show the lowest maturity ratio and are thus the development areas for South African organisations. Table 1 reflects the comparative project management maturity between various countries who participated in the international research project; the South African survey was done by the University of the Free State.

Table 1: Average Project Management Maturity: International comparison

Country	Average Maturity Level %
South Africa	62.0
Slovakia	47.0
Austria	58.0
Finland	63.0
Germany	60.0
Romania	39.0
Lithuania	47.0

Source: Adapted from: Project Management Group (International), 2007: 63

The research in respect of project management maturities of nations or societies, concentrated on dimensions and processes related to key performance areas or functionalities within a specific social system. These dimensions and processes were influenced mainly by performance and perceived outcomes of the functions, but may perhaps grant the opportunity to compare other social systems with project management and social systems with one another.

2. RESEARCH METHODOLOGY: Dimensions of Construction Management maturity.

The aim of the research project was to establish the most important dimensions or elements that may determine the level of maturity of a social system, association or specified profession specifically as a learned society. A selected group of twenty professionals were provisionally included in the survey to establish possible perceptions and tendencies. These include professionals and academics who are viewed as the leaders in the construction management profession. The invited group were requested to complete a questionnaire, related to maturities, and the results were used to capture the data. The response rate was 55%.

To illustrate the value of each dimension, a brief overview is necessary:

3. EDUCATION (Dimension 1)

Education is perhaps the most important dimension to determine the level of maturity of a specific profession within the investigated social system per nation.

This is evident in the registration policies of a statutory council membership acceptance by institutions or associations and the level of education expected of entrants for membership or registration (RICS, 2005;

2007: online; ASAQs, 2007: online; SACQSP, 2007: online; 2007a; 2007c; CIOB, 2007; South Africa, 2000: Act 48).

It is important to evaluate a profession regarding education elements such as entry level qualifications, accreditation of providers, level and number of higher qualifications within the profession, and the provision.

4. TRAINING (Dimension 2)

Most professions require an in employment training period after qualification to ensure that candidates adjust to practice and are trained to practice in an independent functionary profession.

The South African Council for the Quantity Surveying Profession (SACQSP), the South African Council for the Project and Construction Management Profession (SACPCMP) and the Chartered Institute of Building (CIOB) require in-house candidateship after obtaining a recognised tertiary qualification, with some allowances for recognition of pre-qualification employment (SACQSP, 2007a; 2007b; South Africa, 2000: Act 48 art. 13).

Respondents' perceptions in respect of the principle and duration of training were obtained to establish the importance of training and the training time period.

5. MENTORSHIP (Dimension 3)

It is noteworthy that experiential training, supported by active mentoring, may not be emphasised adequately. As is the case for professions such as medicine, accounting, engineering and law, etc. it is imperative that the scientific use of mentoring in developing a learned construction management profession should be mandatory (Verster & Hauptfleisch, 2007).

The general accepted meaning of mentorship is that it is utilised to support a process of transferring knowledge and skill. Typically this entails that an older knowledgeable person imparts knowledge and skills to a younger protégé (Verster & Hauptfleisch, 2007).

Mentorship is thus seen as an important dimension of a mature profession in a learned society.

6. CONTINUING PROFESSIONAL DEVELOPMENT (CPD) (Dimension 4)

Continuing Professional Development (CPD) is seen as an important dimension in ensuring that a profession or function within a specific society or association, and the members thereof are continuously developed to

keep up with the latest tendencies, skills and knowledge relevant to a specific profession. This must be done throughout professional life (Cruywagen, 2007).

Many professional bodies, councils and associations have policies in place to ensure that registered persons or members achieve the CPD requirements. Some examples are the RICS, ICEC, CIOB, SACPCMP and the SACQSP (SACQSP, 2007: online; CIOB, 2007a: online; ICEC, 2007: online; RICS, 2007: online).

It is however acknowledged that most professional bodies support CPD to ensure pro-active development of their field of activities.

7. RESEARCH (Dimension 5)

The research output of a specific society and its members is an important benchmark to establish the level of maturity of scholarship within a specific social system.

The importance of research is underscored by noteworthy professional institutions. An education provider for instance can not join the RICS partnership if they do not achieve the required research output (RICS, 2007a: online).

The level of importance given to research by respondents assisted in establishing the perceived importance of research as a dimension and also in establishing the maturity of a society. Research is seen by most professional associations as fundamental to development.

8. MARKETING (Dimension 6)

Referring to marketing as a maturity dimension within the profession of project management, Fuessinger (2006: 3-4) defines marketing as a national project management association.

For the purpose of the research project, marketing is extended to involve an established identity and status of a profession, members standing in a society, and a marketing strategy of the profession.

During 2008 the CIOB engaged a re-vitalization exercise; a co-ordinated approach to enhance it's image and strengthen the construction management profession. This exercise is currently ongoing (CIOB, 2007: online).

This dimension was also tested to establish the level of importance of marketing in a mature profession.

9. INFRASTRUCTURE (Dimension 7)

The creation and availability of infrastructure to support members of a profession is seen as an important element of maturity for a specific profession. Infrastructure related to construction management includes CIOB, ASOCSA and the SACPCMP.

Responses in respect of the role of infrastructure on the maturity profile of the construction management profession were needed to establish the relevant importance of dimensions or determinants.

10. LAW AND LEGISLATION (Dimension 8)

Not all professions within a specific country are governed by Law and legislation. The status of many professions as learned societies rely on the need of the services required by the market. Discipline and control in respect of ethics and standards are upheld by an established professional body like the RICS, ICEC and CIOB. By law, in South Africa, the CIOB and ASAQs are voluntary organisations of members elected to join the association if they possess the required entry level.

The construction management profession is however governed by Act 48 (South Africa, 2000). The Act aims at ensuring standards and discipline in respect of the profession in South Africa (South Africa, 2000). This dimension was tested to establish its relevant importance.

11. STANDARDISATION (Dimension 9)

The construction professions in South Africa have, separately and jointly, over many years, developed standards and model documentation to assist members to perform their duties and to enable the market to standardise in respect of systems, contract documentation, reporting and communication (JBCC, 2000: 9).

Standardisation as a dimension was included in the questionnaire to establish its role and influence on the profile of the profession as a mature profession and a learned society. One must however also be critical of some elements of standardization as these may be seen as limiting creative development and growth of knowledge.

12. MANAGEMENT PRACTICES (Dimension 10)

The evidence of management practices within a profession may also be seen as an important determinant of a mature profession. This was true in respect of the maturity research done previously. Business process management was identified as a dimension of reasonable importance for

maturity measurement of a project orientated company. A weighting of 10% was allocated to this dimension (Garies, 2005: 32; and Gasse, 2006: Online).

It was therefore necessary to include management practices as a dimension in the questionnaire to establish its relative importance in respect of role and influence on the construction management profile.

13. TOTAL QUALITY MANAGEMENT (Dimension 11)

The evidence of total quality management systems present within a profession to ensure the delivery of quality services to clients is seen as a dimension and determinant of the level of maturity of a profession.

Gareis identified assurance of quality as an important dimension of a project management-oriented maturity model, with a 10% weighting (Gareis 2005: 32; Gasse, 2006: Online).

It may therefore be suggested that quality management of services within a social system is important in establishing the maturity of a specific social system.

It needs to be pointed out that education, training, CPD, mentorship, research and discipline within an association are related to the governing of a profession and are therefore also quality indicators.

14. RESEARCH FINDINGS

The responses to the questionnaire were individually completed by eleven out of twenty (55%) of the selected people. The selection was based on their experience in related fields of study and practical knowledge of the industry. This was done in order to determine their perceived opinions on the importance of each dimension's role and the influence of each on the profile of the construction management profession, specifically related to South Africa. This may also be true in respect of all construction professionals and other social systems and / or nations (University of the Free State, 2009).

The respondents were requested to give their opinion on the level of maturity of the profession related to the 11 dimensions. This was a perception test only, but may be valuable to understand the anticipated difference between opinion of maturity and perhaps the under-valuation by respondents of a very important dimension or determinants of a learned society.

Table 1 shows the averages of all questions answered by respondents, related to each dimension.

Table 2: The importance of the Dimensions: Construction Management

1 - Dimension	Average on 1-5 scale
A. Education	4.1 (82%)
B. Training	3.8 (76%)
C. Mentorship	4.6 (92%)
D. CPD	4.5 (90%)
E. Research	4.2 (84%)
F. Marketing	4.2 (84%)
G. Infrastructure	4.3 (86%)
H. Law and Legislation	4.5 (90%)
I. Standardisation	4.7 (94%)
J. Total Quality Management	4.5 (90%)
2 - Opinion	
Construction Management as a mature learned society	3.2 (64%)

Source: (Verster, 2009: Own table)

(Results in table 1 were captured from a 1-5 point Likert scale where A to K is 1 = not important and 5 = most important. For testing opinions as shown as 2:, a 1-5 point Likert scale was also used where 1 = not at all and 5 = completely)

As indicated by respondents, all 11 dimensions are seen as important to establish a mature learned society. The weighting of each could not be done from the results and more research is needed, but it is reasonably clear that the dimensions selected by the research group are seen as important. The opinions of respondents related to sub-dimensions may also be noteworthy. Sub-dimensions are seen as elements that may be important in supporting main dimensions.

Table 3 illustrates the averages on a 1-5 point Likert scale where 1 = not important and 5 = most important to measure sub-dimensions related to each of the 11 dimensions included in the questionnaire.

Table 3: Sub-dimensions: the expected level of graduate education and profile of professionals

SUB-DIMENSIONS	1-5 Scale
Education (Dimension 1)	
1.1. At university level	5
1.2. Number of Masters and PhD degrees present in a professional society	4
1.3. Education providers with international accreditation	4.2
Training and Mentorship (Dimension 2)	
2.1. Post-honours training	3.7
2.2. SACPCMP	3.9
2.3. Mentorship	4.6
CPD (Dimension 4)	
4.1. Obligatory career CPD	4.5
Marketing (Dimension 6)	
6.1. Identity and status of profession's growth	4.2
6.2. Profession's official marketing strategy	4.2
Infrastructure (Dimension 7)	
7.1. Institutional support and control	4.5
7.2. Training and technical support	4.1
Law and Legislation (Dimension 8)	
8.1. Discipline and control by Act, regulations, code	4.4
8.2. Professional ethics	4.7

Source: (Verster, 2009. Own table)

Respondents indicated that the number of individuals/members with a Masters or PhD degree, in a learned society, is not as important as for most other sub-dimensions. Noteworthy that this may be an indication why South Africa is behind in comparison with developing countries in respect of people with advanced degrees (Rapport, 2008: 17).

The question may therefore be asked; is this not perhaps a negative indication of the maturity level of this specific society?

Analysing the above, the following becomes clear in respect of the sub-dimensions:

- An honours degree as entry level to the profession is identified as most important for a profession to be seen as mature and a learned society (88% importance);
- The in-training period is very important;
- CPD is seen as important;
- An established identity in the market is shown as important for the identification of the professions in a mature system;
- Infrastructure is important, and

- Respondents were almost unanimous in identifying law, acts, regulations and professional ethics as vitally important. An average of 91% importance was allocated to this sub-dimension.

15. CONCLUSION

The first objective of the research project was to identify the most important dimensions. It was expected that some of the dimensions and sub-dimensions would have been identified as less important. The respondents did not respond in this manner. It is important to note that the research group achieved reasonable success in identifying 11 very important dimensions of a mature learned society.

It is also proposed that some dimensions and sub-dimensions may be combined to establish a viable maturity model based on the proposed eight most important dimensions. These combined dimensions are indicated in Table 4. The education dimension, for example, is now shown to be of 4.4 (88%) importance because of the combinations of 1.1, 1.2 and 1.3.

Table 4: The eight most important dimensions and their importance

EIGHT MOST IMPORTANT DIMENSIONS	IMPORTANCE
1. Education	4.1 (82%)
2. Training and mentorship	4.1 (82%)
3. CPD	4.5 (90%)
4. Research	4.2 (84%)
5. Marketing and infrastructure	4.3 (86%)
6. Law and legislation	4.5 (90%)
7. Standardisation	4.7 (94%)
8. Management practice and quality management	4.5 (90%)

Source: (Verster, 2009: Own table)

From the above it becomes clear that the allocation of weights to the various dimensions may be very difficult if not impossible. However, it may perhaps not be as important as originally thought since it may be deduced that the dimensions should be in balance, and therefore, for a learned society to be seen as mature, all identified dimensions should be present and strong.

It is proposed that all eight dimensions are therefore of fundamental importance to develop the construction management profession. From this proposal, a model may be developed to ensure equilibrium between the most important dimensions of development and professional skills.

Further study to benchmark the professions to the eight most important dimensions may constitute the next investigation.

16. RECOMMENDATIONS

It is proposed that a model may be developed to determine the maturity profile of a social system (profession, society or nation) as a learned society. This may ensure equilibrium between the most important dimensions of development and professional skills.

It is also proposed that associations, institutions, or a society can be measured in respect of its maturity as a learned society, or their role toward maturity of a social system, by measuring its strengths in respect of the eight suggested dimensions in Table 4, relative to the importance levels as well as the standing and presence of the various maturity dimensions.

Figure 3 shows a maturity spider web to suggest the form that a model for a profession's maturity may take.

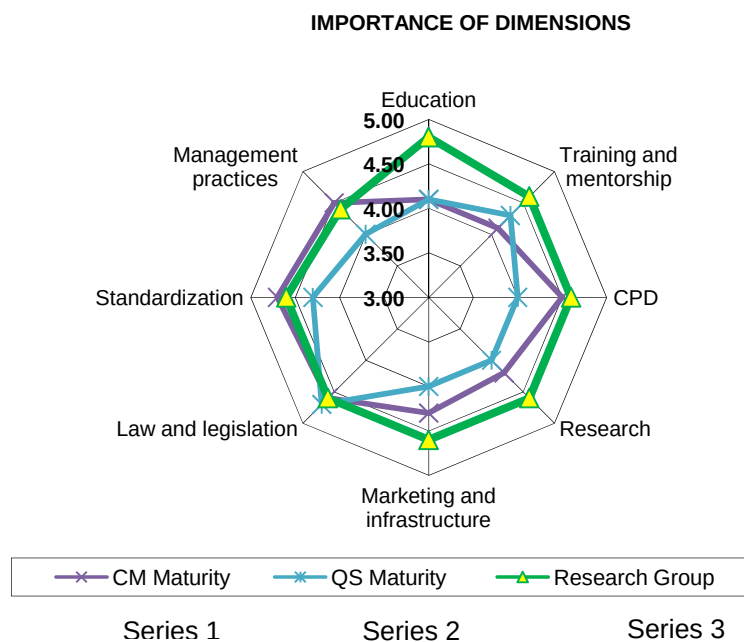


Figure 3: Spider web for a maturity model of a learned society

Source: Adapted from Project Management Group (International), 2007

Three series are shown in the spider web, these are:

Series 1: The importance as identified by respondents in respect of construction Management maturity

- Series 2: Comparison with previous research responses on quantity surveying maturity
- Series 3: The research group's proposed maturity level: The yardstick that may be related to measure a social system's maturity as a learned society

It is understood that a more comprehensive survey on construction management maturity may be necessary to ensure more valid results. However, current results show an acceptable comparison to other results on Quantity Surveying and Construction Management.

The direction that the research may take is towards the actual measurement of a social system based on an investigation of the presence, and standard levels, of each dimension compared to what is seen as world class in related societies. To understand the maturity of a specific society, the standard levels of each dimension or pillar should be measured. The results of these measurements will support strategic development of such a society.

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NEW APPROACH TO TEACHING PROCUREMENT IN GRADUATE EDUCATION

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ABSTRACT

Purpose of this paper

The purpose of the paper is to propose and test to transform the teaching of procurement/project management from an education based approach to a research based approach, to change the focus from the instructor's knowledge to changing the student's work environment, and to change the industry environment by research testing instead of education.

Design/methodology/approach

The design of research based University of Botswana (UB) procurement course is based on successful PBSRG model. The UB course was transformed from education based to research based. The focus of class is on deductive logic models, and research application instead of textbook education. Class was run to identify if it increased research activity.

Findings

Over the period of five months, the course was transformed. A core group of faculty was trained. The students were tested and measured. Six research tests were started, three more tests being negotiated. Thirteen publications were submitted. Two long term research contracts (\$25K US)

are being negotiated. The level of research activity has been increased in the test group from no activity to the current level.

Value/Originality

The new research based model can be used by university units with limited research funding, research capability, resources, and current knowledge.

Keywords: Graduate construction procurement education

1. INTRODUCTION

A Fulbright Scholar (FS) was requested to the University of Botswana Project Management (PM) Section to increase the research capability of the their staff and graduate project management program and assist in building an industry/university research platform that would generate research activities (research tests and funding from industry.)

The current graduate Masters of Project Management (MPM) program at the University of Botswana (UB) is made up of six required classes and five elective classes (from 7 to 11):

1. Human Resource Planning	7. Project Risk Analysis
2. Project Planning	8. Project Assessment
3. Project Environmental Analysis	9. Project Quality, Health and Safety Management
4. Project Resources Procurement and Administration	10. Project Legal Environment
5. Research Methodologies	11. Project Leadership
6. Project finance, cost	

Of the eight classes taken by graduate students, only the Research Methodologies class is research oriented, and it is the research methodology that makes it research based. The rest of the classes are exposure to existing industry practices and exposure to different technical aspects of project management (PM). The classes are textbook oriented, using assignments and exams to assess the student's capabilities. The procurement class syllabus is no different. It has the following topics:

1. Project requirements, requirements analysis, and schedules
2. Procurement planning, procurement strategies, and contracts
3. Selection and acquisition of vendors/contractors/suppliers (solicitation, and source selection)
4. Management of project procurements, contracts, project programme, valuation, certificates and payment, project changes, and resultant claims; contract close-out
5. Resource allocation and limitations; capital, personnel, plant & equipment, materials and supplies, space; resource leveling and smoothing, critical chain
6. Resources control, purposes of control, follow-up, updating and reporting, physical asset control, human resource control
7. Ethical and governance issues in procurement-transparency, fairness and accountability in procurement

All the topics are textbook based, and attempt to teach students about traditional procurement, contracts, and management of the contracts. These graduate classes are educational based. Students come to the program to get a degree by becoming smarter project managers. They do not change their PM/procurement environment. The result at the UB, is that research activity was non-existent, the impact of the graduate program, classes, and students on changing the industry was negligible.

1.1 Current State of Procurement Performance

The current state of procurement of construction filled with problems **(CFMA, 2006; Lapatner, 2007; Post, 1998.)** The industry structure diagram (Figure 1.1) identifies that procurement problems exist in the price based environment (Kashiwagi, 2009).

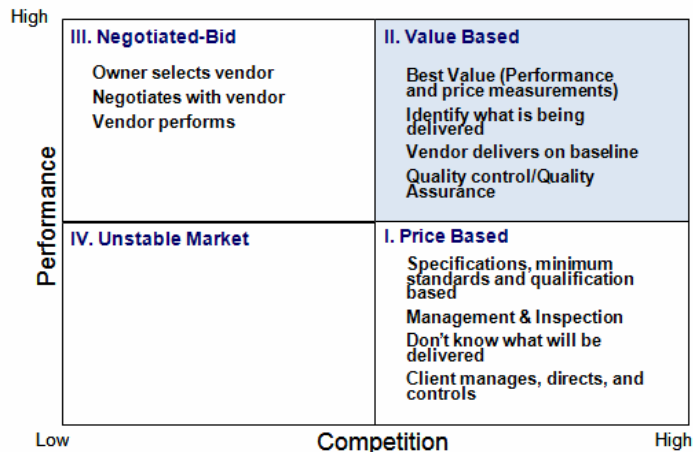


Figure 1.1 Industry Structure (Kashiwagi, 2009).

Most procurements are in the price based environments have the following characteristics (Kashiwagi, 2009):

1. Use minimum standards to identify the requirement.
2. Creates an adversarial environment as the minimums are turned to maximums by the vendors, and vendors attempt to make profit by reducing quality.
3. Maximizes the use of management, direction, and control.
4. Maximizes decision making which is the biggest source of transaction risks and costs.
5. Due to the inability to predict exactly what quality is being delivered, the client or buyer must manage, direct, and control the vendor.

This is a reactive, management based, ineffective procurement process which is the most used procurement process used in the world and in Botswana (Kashiwagi, 2009; Adrian, 2001; Simonson, 2006; Lapatner, 2007; Flores and Chase, 2005; Ssegawa et al., 2007; Rwelamila, 2000; Lionjanga, 2003). This is the traditional procurement processes taught in graduate procurement programs, training and certification for project managers, and in undergraduate programs (Kashiwagi et al., 2008a; Kashiwagi, 2008b).

The reason for the continuation of the teaching of such inefficient practices may include graduate procurement courses are textbook based and education/training based on existing practices that focus on becoming more expert using traditional PM and procurement talents. Project management curriculums are still proliferating the management, direct, and

control approach which is used in the price based procurement environment.

1.2 Best Value Environment

The best value environment is not well understood. The only major research center doing extensive research in the area (repeated hypothesis testing) is the Performance Based Studies Research Group (PBSRG) at Arizona State University (Egbu et al., 2008). They are also the International Council for Research and Innovations in Building and Construction (CIB) Working Commission 117 The Use of Performance Information in Construction, headquarters, and the home of the CIB Journal for the Advancement of Performance Information and Value. They have been defining and testing the best value concepts for over 15 years in construction and other industries. PBSRG states that the movement has to be made from a price based to a best value procurement environment before the high performance, high value procurement results can be obtained (Kashiwagi, 2009.) The best value procurement process has the following characteristics (Deming, 1982, Kashiwagi, 2009, Chong et al., 2007):

1. Aligns instead of directing resources.
2. Transfers risk and control to the vendor.
3. Vendor identifies their baseline plan and schedule.
4. Minimizes the importance of the procurement agent's decisions and the contract.
5. Forces the vendor to do quality control, uses a weekly risk report, and the buyer/client to do quality assurance (ensuring the vendor has a quality control and risk management plan program).
6. Vendors regulate their own contract by measuring the deviation from their baseline plan/scope.

Testing and historical results have shown that the best value results are (Sullivan et al., 2008; Michael et al., 2008):

1. More efficient and effective.
2. Minimize the need for management and transactions.
3. Maximizes vendor profit while giving the client/buyer the lowest price.

PBSRG proposed that a graduate procurement class designed to discuss and run research tests which moved the procurement environment from a price based to a best value environment would solve many of the existing procurement issues. The course would be based on deductive logic and proven theoretical models that improved construction, and continuous research testing.

The course would be a research based course which was centered around research testing, results, and documentation of the results. The course was designed and run by PBSRG, and led to a very high research level (research grants, new modifications to deductive logic called the Information Measurement Theory (IMT), the establishment of the best value Performance Information Procurement System (PIPS), and the transformation of education based graduate courses to research based graduate courses.

Other characteristics of the “research based” course at ASU include:

1. The students are a valuable resource, and the mechanism of industry research tests and laboratory for research.
2. The students hypothesis testing can change industry practice.
3. The goal of the course is not a grade, but to change their organization.
4. The instructor gives deductive concepts, and past research results, and helps students create change.
5. The students increase their ability to change dominant issues in their environment throughout the program, ending with the writeup which is their thesis which will change industry practice.

This format for the research based course has been used at PBSRG at Arizona State University for the past five years. It has resulted in increased research activity (\$1M US in 2008, brought \$100M investment into ASU due to the new delivery system through efficiency, and has expanded research outside of the construction industry into IT, food services, and professional services), has brought industry partners to PBSRG, and has validated the deductive logic of IMT, and brought PBSRG worldwide recognition through CIB W117.

2. HYPOTHESIS

The authors are proposing that the research based approach can be used transferred to the University of Botswana MPM graduate procurement and project management classes to raise the level of research, to form an industry/university research platform, and to have an impact on industry practice.

2.1 Methodology

A MPM course was selected and transformed it into a research based class using a successful model from PBSRG. Despite potential differences in the environment, the authors proceeded with the test. The course was taught in the Fall 08 semester by the FS. The research based course curriculum

from the test case is described in this paper. The results are discussed later in the paper.

The course format follows the scientific method (Figure 2.) The procurement graduate course syllabus/periods was divided into four main modules: a) presentation of deductive logic and best value practices based on deductive logic, b) literature search of procurement processes/systems that have documented performance measurements, and identifying the existing processes at student's organizations, c) create solutions for existing systems which will increase performance and value, and test solutions, documenting results d) publish test results in homework assignments, refereed publications, and thesis.

The Construction Industry Structure model was used at four different levels (vertical layers from conceptual, to practices, to existing systems, to test results) to direct the course/research work towards efficiency, alignment, self direction, preplanning, measurements of deviation, higher value, and higher performance. At the top level, the discussion of deductive logic concentrates on the difference between leadership (optimal) and management (minimal.) The next level compares the procurement practices of best value (optimal) and price based (minimal) environments. The third level concentrates on the performance of existing systems, and what best value concepts can be implemented to increase performance (in most cases from price based to best value, or from a lower best value to a higher best value.) The fourth level is publication of the test results. If no changes in efficiency, perception of efficiency, or customer satisfaction increase is identified, the student explains the null hypothesis.

All levels are connected by the basic concepts, concepts of procurement practices, existing practices, and documented measurements. By definition, the CIS, differentiates the optimal and minimal by characteristics that are congruent: ie, efficiency, alignment of resources, leadership, measurement, and value, vs. direction and control, management, no performance measurements, and low value/performance. The CIS has been validated as a industry model for 15 years (Kashiwagi, 2009).

The course also has a horizontal strategic plan forcing a "win-win" for the instructor and the students. Both leave with increased capability to create and implement change, identify what to change, and be able to communicate the implementation of change. This forces all participants to understand deductive logic and theoretically correct concepts, analyze existing environments and identify what changes need to be made. This is a different approach to the education based learn and repeat, or training approach.

The objective of the graduate students would then be transformed from students being educated and tested, to students who are generating new knowledge. The graduate program would then educate the industry

with optimized processes that an industry usually cannot develop without theoretical development.

2.2 Vertical Top Down Approach

Figure 2 shows the Top-Down Approach. The four levels and associated research activity include:

1. Leadership/management concepts (literature searches, conceptual/theoretical research)
2. Procurement processes described by concepts (literature searches, surveys, data collection, and analysis of data)
3. Existing practices modified to increase optimal concepts or move from price based to best value practices through testing or education/survey results (identify logical concepts, create or modify processes, test, and analyze results)
4. Publishing of results in homework assignments, refereed publications, and thesis (validate the concepts, data, and processes)

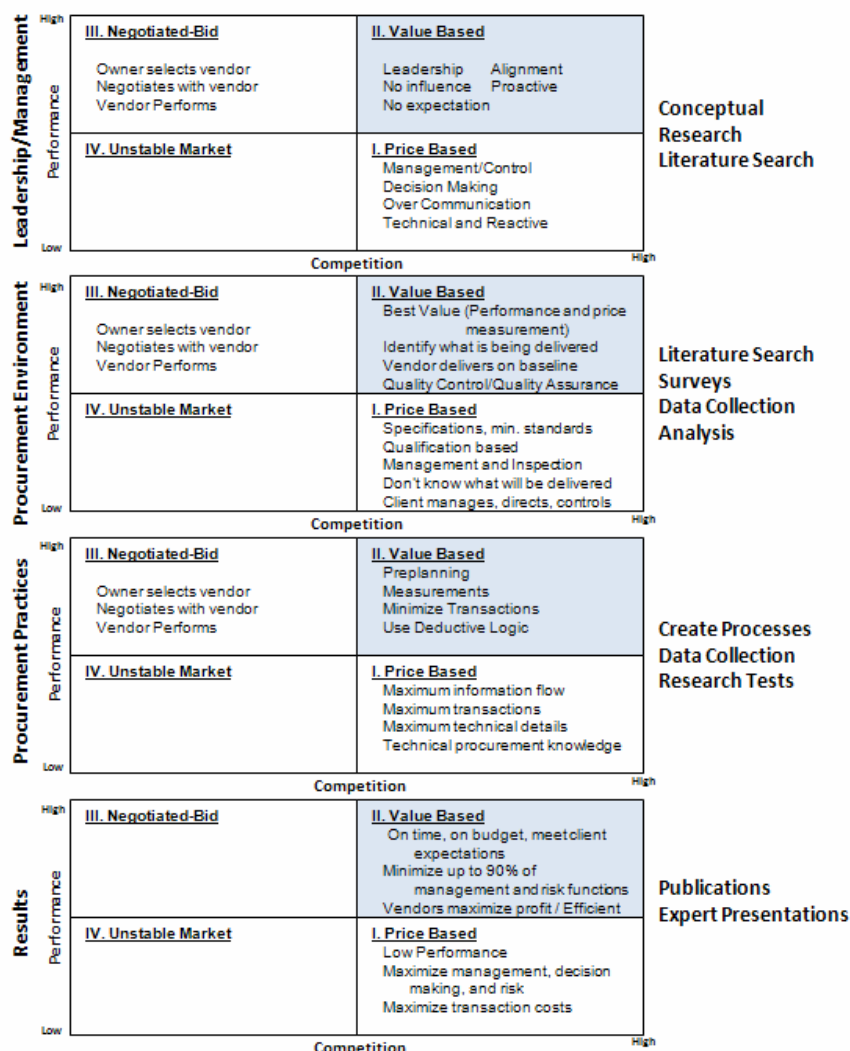


Figure 2: Vertical "Top down" Approach

3. PROPOSED RESEARCH BASED CURRICULUM

The "Top Down" Approach described in Section 1.2.1 and 1.2.2 in terms of a deductive logic (1-4), procurement practices (5-6), research hypothesis testing (7-9), and documentation (10) translates into the curriculum shown below (weeks):

1. Information Measurement Theory, Leadership vs. management. (1)

Proceedings 4th Built Environment Conference
New approach to teaching procurement
in graduate education

17-19 May 2009
Livingstone - Zambia
ISBN: 978-0-620-43702-8

2. Industry structure. (1)
3. Best value vs. price based processes. (1)
4. Analysis of BV vs. PB environments. (1)
5. Price based processes. (1)
6. Best value processes. (1)
7. Identifying processes at organization including write up and report. (2)
8. Potential modifications at organizations including write up and report. (2)
9. Testing, partial testing, or using survey on organization participants. (2)
10. Final write up and report. (2)
11. Tests (overlapping with research work). (2)
12. Final Exam. (1)

The deductive logic would impact and integrate with the leadership class, the risk class, the PM assessment, monitoring, and evaluation class, project planning, and project environment classes. This type of curriculum has been tested at PBSRG/ASU in the Facility Management and Project Management graduate program, and has accelerated research activity. The following are anticipated results of the program:

1. The educational partners become research partners.
2. The research tests become the course materials.
3. Modifications to processes are created.
4. Staff become interchangeable as they understand the deductive logic.
5. The graduate program becomes a research based program.

3.1 Horizontal Strategic Plan

The horizontal strategic plan is in Figure 3. There are two main participants: instructors and students. The instructors present the latest research results, sets the example as a change agent who is open to change and has done research bringing change, leads discussions, assists students to understand the constraints of their organizations' procurement processes, and what changes may be possible. The students will then run tests or develop concepts in their organization. The students will then document their test results in the form of homework assignments, refereed papers and foundation of thesis, and the instructor will then take the results of the class and run further research with the next class. The students become the focal point and the valuable resource in the course.

The most difficult component of the transformation of the course is to identify instructors who can think conceptually, who can align accurate concepts with practices, and who can align students, their organizations, and their practices. Faculty have been education based in traditional education based structure for many years. They must be deprogrammed.

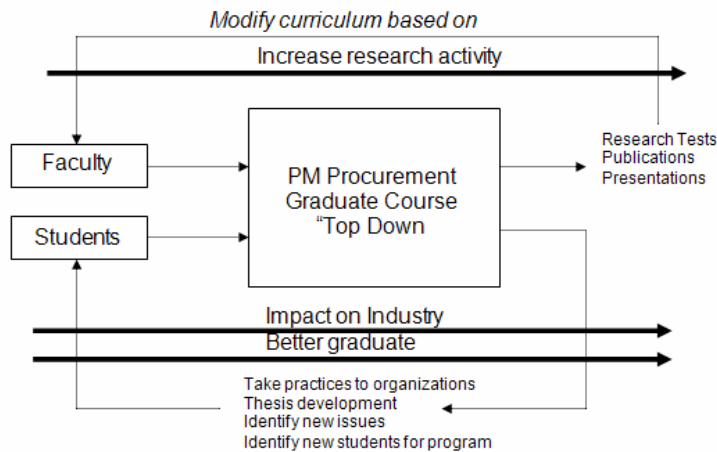


Figure 3: Horizontal Strategic Plan

4. CURRENT CASE STUDY/RESULTS

The FS from the PBSRG at ASU is currently working with a core group of UB lecturers to turn courses into research based courses. The FS selected the Assessment, Monitoring, Evaluation course. The course was transformed into a research based PM course for procurement agents. The curriculum was brought from PBSRG where it proved to be very successful in developing conceptual logic, identifying and differentiating between optimal and minimal procurement practices, generating research grants/tests, and providing publications which analyzed test results. The course results at UB included:

1. Six industry research tests started, three more being negotiated.
2. Interfaced with seven different industry groups.
3. Educated/trained three of the faculty in the research based approach and the PIPS/IMT technology.
4. Implemented the philosophy and technology into four different graduate classes.
5. Eight graduate students were interested in implementing the approach in their thesis work.
6. The faculty have been involved in writing 13 refereed conference papers, with a goal of 20 total papers being planned for the year, including 5 journal papers.

In the core group who participated with the FS, these results were totally unexpected. The four lecturers in the core group had no past research activity in the past two years. The test case proved that a procurement PM

course can be transformed into a research based class at UB and raise the research activity level. It does not prove sustainability of the concepts once the mentorship of the research based FS leaves.

5. CONCLUSION

This is a case study of transforming a graduate PM procurement class from an education, textbook based class to a research based class. The transformation previously led to the successful transformation of PBSRG and the formation of CIB W117 and the Performance Information Journal. The current effort tested the transformation of a PM procurement course at UB with relatively successful results. The transformation has the potential to pull through the MPM program to become a research based program. It will also assist graduate students become more comfortable with doing research that impacts industry, bring more of the industry to the university, and add tremendous value and improvement to procurement systems in Botswana. The effort is in its first year, and as the transformation goes on, further documentation will be published. For further information contact Aderemi Adeyemi, at adeyemiy@mopipi.ub.bw and ayadeyemi@yahoo.com.

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QUALITY MANAGEMENT IN A FURTHER TRAINING AND EDUCATION INSTITUTION: A CASE STUDY OF AN FTE COLLEGE IN ZIMBABWE

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ABSTRACT

Purpose of this paper

The study aimed at investigating how a further training and education (FTE) institution manages the culture of quality. The paper sought to adopt a total quality approach in which all of the aspects were assessed and evaluated at an FTE college, with a view to formulating recommendations to improve quality in most colleges currently offering similar courses in the southern African region.

Methodology

Various parameters that impact on quality were investigated such as teaching aids, the learning environment, utilisation of technology and better communication skills. Interviews were conducted and questionnaires administered to extract information from the sample population. Participatory observation was also used in this research.

Findings

Quality was found to be affected by factors such as the learning environment; availability of resources, quality of students enrolled and staff qualifications. There is therefore a need to hire appropriately qualified staff and to use the necessary teaching software and hardware such as teaching aids and amenities.

Value of paper

The paper highlights the essential areas that need to be improved. In this regard further training of educators will instil self-confidence and encourage them to register with professional bodies. This will result in enriched lecture delivery. Further to this, high-quality delivery of lectures will help produce

high-quality employable graduates who will contribute to national development.

KEYWORDS: Quality assurance; Continuous improvement; Further training and education (FTE) college; Learning environment

1. INTRODUCTION

Quality is one of the most important issues in education, business and industry. Companies currently invest large sums of capital to achieve good quality in their organisations. Different people have different definitions of quality. To some, quality means good academic results. For an FTE college administrator, quality may be synonymous with the improvement of administrative issues. The College Treasury may view quality from the perspective of making good use of school money. At the other extreme, society sees quality from the perspective of the institution's ability to conserve traditional values. This paper sought to adopt a total quality approach in which all of the aspects were assessed and evaluated at an FTE institution, with a view to formulating recommendations to improve quality in the institution. Quality has three essential features in education systems. These are efficiency in meeting set goals, relevance to human environmental needs and the pursuit of excellence as well as human settlement. If the education system is to survive its current crisis, it must provide society with graduates who are not only employable, but who are also employers – only then can we say education is of a 'quality' standard.

2. BACKGROUND

It is evident that there are problems with the education system in southern African FTE colleges. Students are leaving or graduating from colleges seemingly unprepared to meet the demands of society. This may be attributed to the education system adopted by the government from the colonial era, which sought to make the locals semi-trained employees and second-class citizens. This was achieved by providing blacks with substandard (non-quality) education. The graduates channelled through these systems are not prepared to become responsible, productive citizens and therefore become a burden to society, increasing social welfare costs. They impact the criminal justice system, and above all, are not prepared to meet the needs of the next generation. Thus, there is a need to review the curriculum so that the end products (graduates) are able to meet the needs of society. Various factors impact on the teaching-learning process and hence affect the end product.

For instance, the problem may lie with the teaching methodology or metrologies applied in the training institution, or the curriculum may be inappropriate, or supporting resources may be unavailable. These and other factors are investigated in this paper in a bid to pinpoint the problem.

3. STATEMENT OF THE PROBLEM

The need to produce quality work output in all departments at an educational college cannot be overemphasised (total quality approach). Quality work output impacts on the overall quality of the graduates produced by the college. The factors considered in the case study include instructional methodologies employed, availability of resources, staff competence, as well as curriculum relevance. The study aimed at identifying flows in the FTE system at the college in Zimbabwe which may be hindering the quality process in the programme offerings. This was done with a view to formulating some suitable recommendations or solutions to these problems so that the quality process is enhanced.

4. LITERATURE REVIEW

Quality means different things to different people. The literature review covers quality issues in educational systems from different authorities. The accepted definition of quality and some of the sub requirements are given. Views of some quality proponents are also given, together with a brief history of the quality concept in education. In some ways, the International Organization for Standardization (ISO) put the quality concept on the map. Developed more than a decade ago, according to the ISO website, the ISO-9000 family of standards includes the 9001 guideline to be adopted by manufacturers and 9002 specifications for service-oriented institutions (education included). Initially, the concept was applied in the manufacturing industry only, as explained by Crosby (1996). However, of late, the quality concept has been applied to the service industry, education included.

4.1 A definition of quality

There are different definitions of quality in the education system. To some, quality means getting good results. For the administrator, quality may be synonymous with the improvement of general standards of managing the institution. Zvobgo (1997) says that quality has three essential features. These are efficiency in meeting set goals; relevance to human societal needs and conditions, and something more in relation to "the pursuit of excellence and human settlements". There are many quality gurus who have developed concepts and ideas in quality management. Dr. Juran is recognised as one of the fathers of quality and defines quality as "fitness

for use”, Gryna (2007). He asserts that the quality system of a school should be “to develop programs and services that meet needs of employers and society”. In other words, Juran is of the opinion that the curriculum must answer to the needs of society and of the employers for it to be of good quality. According to Walklin (1992), the barrier that prevents schools from improving the quality of education is the grading system. Zvobgo (1997) maintains that an inappropriate curriculum leads to non-quality in education. These are referred to by Walklin (1991) as the 6 M's and are detailed below.

4.2 The 6 M's approach to quality control (Walklin, 1991)

Manpower - this includes all trainers or lecturers and support staff with their experience, knowledge, skills and attitudes. Customers will expect trainers and support staff to be experienced, knowledgeable and skilled, and to display a supportive attitude.

Machines - trainers are expected to be competent in the use of machinery, state-of-the-art technology such as computers and other capital equipment. These resources must be sufficiently used by the students to remove technology phobias.

Materials - these include software and expandable resources. Software in educational technology relates to the provision of visual aids, handouts or recorded resources. Hardware consists of machines or other equipment used to produce materials.

Methodology - a range of training methods should be used. This gives an indication of the ability of the staff and systems to carry out training requirements and to meet customer contracts consistently and correctly.

Measurement - a way of measuring performance of the lecturers, students and even capital equipment must be in place. This can help improve the quality of service delivery by improving areas that fall short.

Deming (1982)'s idea was that quality improvement is a cyclical and continuous process and could be regarded as a continuum with four stages.

In an attempt to react to the demands and ever-increasing pressures from its stakeholders, the education system, and the higher education system in particular, finds itself in a market-oriented environment with internal and external customers, where “delighting the customer” is the rule for survival in the long run (Sahney *et al.*, 2004).

5. METHODOLOGY

According to Mouton and Marais (1988), research design refers to the method on which an investigation is based. The qualitative approach was chosen because of the non-quantifiable nature of some variables being investigated, such as materials and instructional methods. However, in cases where quantitative data was obtainable, such as pass rates and human resources, quantitative methods were used. The 6 M's approach detailed in the literature review was used in conducting this research. This involved questionnaires, interview schedules and observation guides. The data obtained consists of detailed descriptions of situations (e.g. availability of resources, human resources and media) and direct quotations from people in their interviews. The respondents targeted in the research were students, lecturers and potential employers of the graduates. The study population is the sample selected to represent the target population. In this research the study population was the College of Education in Zimbabwe and involved the staff and students at the college. The conclusions regarding quality at this college can be generalised to that in most FTE colleges in southern Africa.

For data collection, questionnaires consisting of predominantly closed questions were distributed to all participating respondents at the college. Observation guides and interview schedules were used by the researcher to provide first-hand data of the prevailing situation in the college. Interviews were used mainly for obtaining information from the lecturers and other staff members. Personally recorded data was made available to archive a discrete description of quality at the college. For a study of this nature, these instruments are recommended and advocated by Murimba and Moyo (1995). Two types of questionnaires were designed - one for the staff and another for the students. Respondents were encouraged to fill in the questionnaires while the researcher waited to avoid a high non-response rate.

The collection of data from respondents using the respective instruments raised some ethical concerns. In administering the instruments, the researcher paid due regard to privacy by ensuring that respondents were not subjected to unnecessary research questions. They were not compelled to answer questions which they deemed too personal or to give their names. The interviewees were also assured of confidentiality regarding the answers to the questions posed.

6. DATA INTERPRETATION AND ANALYSIS

A total of 30 students were investigated and a staff complement of 10. This represented the final year stream at the institution. Tables, bar graphs and pie charts are used in the analysis and presentation of the research results.

The data collected was analysed to establish patterns that helped the researcher to reach a conclusion.

Table 1.1 Lecturers' competency

Lecturers' competency	Excellent	Good	Fair	Poor
	6	8	14	2
% response	20	27	47	6

From the above table and graph, it can be seen that 6% of students rated the competency of the lecturers as poor, while 94% rated their lecturers as excellent, fair or good practitioners. The information seems to suggest that the staff complement in the college is competent enough to offer effective teaching. The high competency level can be attributed to the appropriate qualifications that the lecturers possess, as revealed by this study.

Table 1.2 Skills acquisition in the workshop

Skills acquisition	Adequate	Inadequate
	8	22
%	27	73

The findings reflected in the table above indicate that 73% of the students surveyed felt that they were not acquiring adequate skills from workshop sessions, while 27% felt that they were. The failure to acquire adequate skills can be traced to the lack of material and projects to work on during workshop hours. Also, the unavailability of spare parts owing to foreign currency problems meant that most of the machinery was broken and could not be utilised.

Table 1.3 Practical and theory work hours

Do you receive enough Practical work?	Yes	No	% yes	% no
	18	12	60	40

Table 1.4 Theory Hours Adequacy

Are theory hours enough?	Yes	No	% yes	% no
	16	14	53	47

Generally the students were of the view that the theory hours and practical hours were enough. From the above tables, it can be seen that 60% felt that the practical hours were sufficient per week and 53% were of the view that the theory hours were adequate. For learning to be effective and of

good quality, sufficient theoretical work needs to be given to equip trainees for the practical sessions.

Table 1.5 Library facilities

Are there enough textbooks in the library?	Adequate	Inadequate	Very adequate
% response	6 27%	20 66%	2 7%

The generally consensus was that the number of textbooks in the library was generally insufficient. From the sample surveyed, 66% were of the opinion that the library facilities were inadequate, 27% said that they were adequate and 7% said that the library was very adequately equipped. However, from the researcher's observations, the library itself can be improved. For instance, the room used is small and only a certain number of students can be accommodated at a given time. Essential textbooks are in short supply or non-existent. There are also no internet services for students to use in the library owing to space limitations.

Table 1.6 Workshop practical hours

Are workshop hours adequate?	Enough	Not enough	Too much
% response	24 80	4 13	2 7

For students to acquire essential practical skills, they need to spend enough time in the workshop. From the research, it was found that 80% of the students were satisfied with the number of hours they were spending in the workshop, 7% thought they spent too much time and up to 13% indicated that the time was not enough.

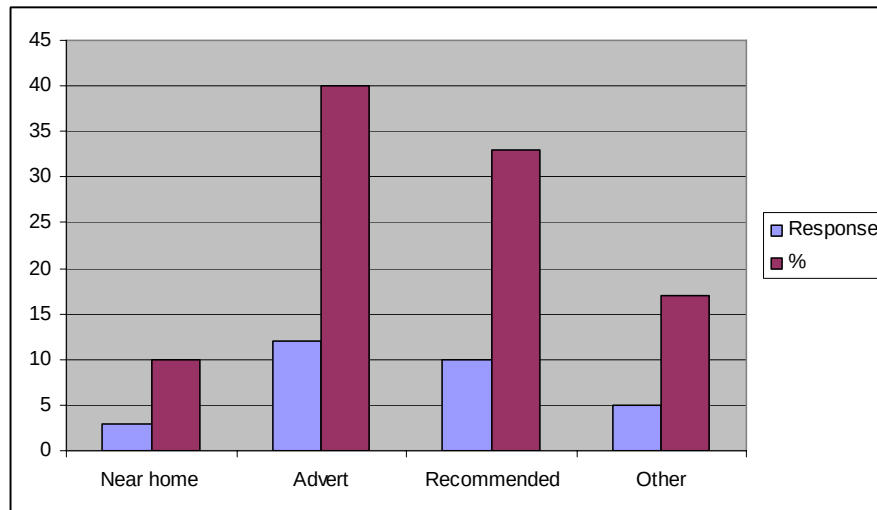


Figure 1.1 Goodwill

A good quality institution will have a good reputation and people will want to recommend it. From figure 1.1 above, the college was recommended by friends to 33% of the students and by their companies to 17%, bringing the total recommendation rate to 50%. Evidently it can be said that the college has a good reputation for quality products in the eyes of society and industry at large.

Table 1.7 Supply of basic resources

Supply of basic resources	Excellent	Good	Satisfactory	Poor
	0	1	1	28
% response	0	3	3	94

Table 1.8 Effect of supply of basic resources on performance

Effect of supply of basic resources on performance	Yes	No	% yes	% no
	26	4	87	13

Common sense suggests that the quality of education suffers in the absence of sufficient basic resources such as adequate accommodation, food and entertainment. Thus, as revealed in the table 1.7 above, 94% of the students surveyed at the college rated the provision of basic facilities as poor and 87% lamented that this affected their learning. Consequently,

facilities can be said to impact seriously on the quality of output in the college.

Table 1.9 Effects of facility shortage on quality

Does the lack of facilities create an anti-school attitude?	Yes	No	% yes	% no
	15	5	75	25
% responses	75	25		

The majority (75%) of the lecturers interviewed were of the view that the shortage of equipment and facilities such as classrooms, workshop equipment and material resources affected their attitude towards service delivery. The subsidies from government are highly inadequate considering the cost of materials. Some of the facilities which the lecturers cited as being adequately supplied included machinery such as lathes, milling machines, grinders, stationery and measuring tools.

6.1 Instructional aids available and their utilisation

The instructional aids available for use by the lecturers, as observed by the researcher and indicated by the staff in interviews and questionnaires, include OHPs, flip charts, video and audio tapes, slide projector, models and chalkboards. Usage frequency of each of the above is indicated in the table below. The table shows that the chalkboard is the most used instructional media.

Table 1.10 Instructional aids available and their utilisation

Instructional aid (IA)	OHP	C/board	Slide projector	Models	Video	Flip chart
Frequency (f)	12	48	3	10	2	2

7. CONCLUSIONS

Students are leaving or graduating from colleges seemingly unprepared to meet demands of society. As outlined in this paper, several issues impacted on the quality of education at FTE and these need to be improved. Financial constraints were discovered to be one of the major setbacks in the departments' attempts to offer high quality training. For example, the lack of materials, instructional aids indicated above in the summary of findings can be traced to the lack of adequate financial

resources. Quality management starts at the top as echoed by Juran, one of the quality proponents. As the researcher observed, one of the reasons why staff wasted time and tended to resort to the same instructional methodologies was the lack of close supervision. As indicated in the findings, there is need to improve the maintenance of machinery in the department especially with regards to practical sessions. For this to be done there is need for spare parts to be readily available in the storeroom. Though most of the staff was found to be qualified and competent, there is need for continuous staff development especially considering the changes occurring in the technological and didactic world. As the research unveiled, most members of staff were not completed in the use of computer for documentation of records and also for drawing.

8. PRACTICAL IMPLICATIONS AND VALUE OF PAPER

Quality is fitness for use or conformity to standards or specifications as dictated by society and industry. This study gives a platform for improving college administration by highlighting skills gaps in educators as well as students. These gaps could be addressed through registration with professional bodies, attendance of seminars and conferences as well as enrolment for higher degrees. This will further improve educators' competency.

9. RESEARCH LIMITATIONS

The study focused on an FTE college in Bulawayo, Zimbabwe. The lecturers/staff, administrators and the students themselves were the target population, with interviews and questionnaires administered for assessment. The study was centred mainly on the staff within the college and did not include other stakeholders, like the community, the employers of the students, the government, non-government organisations and the College Council, who would benefit immensely from the results of this investigation.

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DEVELOPMENT OF A PROFESSOR IN THE PROJECT MANAGEMENT ACADEMIC PROFESSION

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ABSTRACT

Purpose of this paper

Develop a clear mentoring program mechanism to help lecturers advance and develop into professors who can impact the industry.

Design/methodology/approach

The authors are participating in a hypothesis and methodology to change the situation at the University of Botswana (UB). It is a model copied from the very successful Performance Based Studies Research Group (PBSRG) at Arizona State University. The hypothesis is being tested to identify if the lecturers in the resource starved program can utilize the model.

Findings

Four lecturers in the project management section at the UB have used the opportunity of a visiting Fulbright program to setup a mentoring program that accelerates their development into research based professors.

Value

There is difficulty at the University of Botswana and other universities in developing research based lecturers and professors in the project/construction management area. Lecturers of the project management section are tasked with heavy teaching and administrative duties. They have difficulty in attaining professorship due to a lack of research experience. The proposed mechanism would provide a model for the development of research based lecturers.

Keywords: Professor development, research based faculty.

1. INTRODUCTION

In 2008, the Project Management (PM) and Masters of Project Management (MPM) graduate program in Civil Engineering at the University of Botswana (UB) requested a US State Department funded Fulbright Scholar (FS) professor to come to the UB and transfer a best value PM technology and assist in upgrading their Masters of Project Management (MPM) graduate degree (Kashiwagi and Ssegawa, 2008). The technology requires the research based (changing the PM environment) professors and graduate program to be successful.

No research based activity (which changes the PM environment) existed at the UB civil engineering department project management (PM) section. The UB project management section is resource starved, resulting in a difficult environment for lecturers, who require research activity to get promoted. Lecturers have a heavy workload of teaching and administration. The academic environment is very rule based (easiest type of program) and reactive. Lecturers do not have a strategic plan for increasing the level of research.

Project delivery of construction in Botswana has been very poor (Ssegawa, et al, 2007). There is a requirement for a new or modified PM delivery system in the industry. As seen in the US, new practices based on deductive logic and sound business theory must come from the university and visionary, research based professors (Kashiwagi, 2009). Botswana is not different from the U.S. An example is the research effort at the Performance Based Studies Research Group (PBSRG) (PBSRG, 2008):

1. 15 year, \$7.1M research effort, with \$700K leverage funding against new efforts.
2. Over 600 tests, \$2B+ of delivered services.
3. 98% performance.
4. Research impact outside of the construction industry into all areas of project management (Michael, 2008).
5. Tested in US federal government, state governments, universities, and private enterprise (Byfield, 2002; Kashiwagi, 1997).
6. No increase in cost while increasing vendor profit (Sullivan, 2007).
7. Identified twice in Engineering News Record (ENR) (Angelo, 2006; Kashiwagi, 2008).

There is a need for the same technology in China, Australia/New Zealand, Europe, and in Africa. PBSRG has been requested by universities in these countries to transfer the technology. One of the most effective ways to

transfer the technology is through some type of mentoring program (Anonymous, 2002). The country of Botswana is one of the tests.

Upon arrival at the UB, the FS quickly assessed the situation of lecturers and concluded:

1. The UB PM section/MPM program was disconnected from the industry.
2. There was no research motivation/environment to do research.
3. Lecturers had a high workload of teaching and activities (transactions).
4. Graduate program courses were academic or textbook based. They were oriented toward teaching existing practices (Badger, 2001).
5. The textbook information was a minimum of 2-3 years old, due to the requirements to publish the textbooks (average age of 6.7 years).
6. The research the staff performed was studies on determining the current condition of the construction industry. There was no changing of the industry.

The FS had seen this type of environment before, at his own Del E Webb School of Construction in 1994 (Kashiwagi). The attributes of this type of environment include (Kashiwagi, 2008; Sullivan, 2007):

1. No synergy between faculty; faculty work in silos.
2. Every effort is a stand alone effort, research efforts are not integrated.
3. No alignment of teaching, research, and administrative duties.
4. Heavy workload.
5. No strategic planning for research development.
6. Reactive, controlled environment.

This is a difficult environment to do meaningful research, use a strategic plan for research, be an expert on PM practices, have impact on the industry, and get promoted because of research work.

Badger (2001) stated, "The salary structure for construction faculty is influenced by outside perceptions that the faculty members are vocational educators rather than creators of knowledge regarding the construction process. This perception is perpetuated by the relative absence of younger, tenured faculty who conduct research. The actual ages of the 429 faculty members are not available, but a reasonable estimate, based on the author's observation of attendance at national conferences, is 45 to 50 years of age. Over the past three years, the replacement rate is 40 to 50 faculty members per year. Last year, an estimate of only 30 to 50 percent of the faculty vacancies were filled. In many cases, Teaching Assistants, part time Faculty Associates, and Lecturers were hired to fill the gap.

While these hires are usually competent and able teachers, the lack of tenured positions with terminal degrees tends to weaken the core of

construction faculty and limit hiring prospects, which adversely affects the salaries of part-time faculty, full-time non-tenured faculty, and tenure-track faculty with the MS or PhD.” This condition exists at many universities, making it difficult to get lecturers promoted and doing research that will impact the industry. It is much easier to find faculty who will teach the status quo. Faculty who are research based and will change the way the industry does business are very difficult to find.

2. HYPOTHESIS

A program is needed to mentor young lecturers at a PM/construction management section/department at the university to succeed at research that impacts the industry, and to be able to do research based education. The young lecturers need mentorship early in their career to be able to become an expert in their field and to build up their research capabilities. Without research capability they will not be able to run research based education and have an impact on industry practices. The FS will take a proven mentorship model, and test it on the UB faculty in the PM area.

3. METHODOLOGY

The methodology of the mentorship program proposed by the authors is:

1. To identify a successful mentorship program.
2. To identify successful traits of the mentor and the mentored.
3. To identify the requirements of the mentorship program.
4. To identify performance measurements of the mentorship program.
5. To test the mentorship program.
6. To modify the hypothesis/expectation and retest the hypothesis.

4. IDENTIFICATION OF A SUCCESSFUL RESEARCH BASED MENTORSHIP PROGRAM

The FS through the activities of the International Council for Research and Innovations in Building and Construction (CIB), the Associated Schools of Construction (ASC), the Royal Institution of Chartered Surveyors' (RICS) Construction and Building Research Conference (COBRA), and the Association of Research of Construction Managers (ARCOM), identified that there are not many professors who are performing research that changes the industry and teaching research based graduate education.

There are very few mentors who can set the example in doing research testing, having an impact on industry, and teaching research based concepts. In the CIB W117 document "The Identification of the Use of Impact of Performance Information within the Construction Industry," a broad literature search of worldwide publications identified 4,500 refereed articles addressing the use of performance information/metrics in construction (Carey, 2008). It then identified only 16 refereed publications that dealt with results of actual tests with performance measurements, with 75 percent of them originating from the Performance Based Studies Research Group (PBSRG) at Arizona State University.

In the PM/CM area, only one mentorship program was identified which had a research based mentor, a protégé, continuous research tests which changed the industry, and an accompanying research based education curriculum (education based on deductive logic, hypothesis testing and test results).

4.1 Successful Traits of the Research Based Mentor

PBSRG uses the Information Measurement Theory (IMT) and Kashiwagi Solution Model (KSM) technique to describe characteristics of mentors (Kashiwagi, 2009, Kashiwagi J., 2008; Sullivan, 2007). Using the two way KSMS, the following attributes were identified as a mentor's qualifications:

1. Visionary.	have
2. Kind heart,	opposition,
thinking of	his
the interests	technology
of others.	does not
3. Commitmen	bring
t to	change or
mentoring.	real value).
4. Expert in	7. Uses a
technology.	strategic
5. Changes	plan.
industry.	8. Research
6. Has	oriented.
opposition	9. Research
(successful	based
researchers	educator.
are before	10. History of
their time,	industry
and will	prototype/i
have	mplementati
opposition.	on
If a mentor	hypothesis
does not	testing.

11. Publishing in both conference papers and journals.	with change.
12. Looks different from regular professors (innovative, out of the box, entrepreneurial).	14. Excellent presenter.
13. Very confident	15. Aligns resources.
	16. Well organized.
	17. Very productive.
	18. Always positive.
	19. In control of their destiny.

PBSRG research also identified from test results that successful mentors depend more on alignment than influence. Based on leadership theories (J Kashiwagi, 2007), when more alignment (leadership) is used and less relationships and influence (management) are used, the research based results are more predictable and successful. With alignment, mentors show a consistent example that is predictable, clear, and logical, and thus easier to follow. Also, the amount of transactions (activity) is minimized in terms of required instructions and assistance.

The FS has previous mentorship experience to transfer research based technology. The effort at UB is the sixth attempt at mentoring a research based faculty. The previous attempts were:

1. Florida International University.
2. Central Connecticut State University.
3. Glasgow Caledonian University.
4. University of Twente and University of Delft, Netherlands.
5. RMIT, Melbourne, Australia.

Even though some of the attempts were not optimal, in two of the cases the FS is still working closely with the mentored. In the fifth example, the mentoring seems to have taken hold as the protégé is presenting and educating those around them in order to proliferate the ideology prior to the FS's mentoring visits. In the majority of cases, the research activities and research based education did not meet the expectations of the mentor. The reasons include: not enough preparation by the mentored, not enough time volunteered/spent by the mentored with the mentor, misalignment of philosophy of teaching and research program, insufficient level of commitment from the mentored, mentored did not have the required level

of ability to explain the technology, and the inability of the mentor to simplify the research based education.

Lessons learned from the previous attempts include:

1. Alignment must be used.
2. Volunteered time is essential from the mentored.
3. Opportunities have to be made to have the mentored teach the PIPS/IMT concepts.
4. The research based education and tests must be done in parallel.
5. Commitment in terms of funding/time is required of the protégés organization.

When teaching and research are done in conjunction in a mentoring program, the requirement of alignment becomes a dominant filter. It is a requirement for the mentor to be able to quickly identify misalignment.

5. REQUIREMENTS TO BE A RESEARCH BASED MENTOR

The requirements for the mentorship program is to first have an organization and mentors who have a highly successful research based track record. The mentored organization must also be committed. The mentorship must have redundant strategic goals and measureable and scheduled tactical goals. Mentoring is a business. Measurables include:

1. Number of funded research projects.
2. Number of repeated hypothesis tests.
3. Amount of research funding.
4. Number of peer reviewed co-authored papers.
5. Number of book chapters.
6. Conferences coordinated.
7. Positions of authority/ responsibility with international research groups.
8. Number of masters/PhD students mentored.
9. Journal coordinator/special editor.

5.1 Vehicle/Platform for the Mentorship Program

The vehicle for mentoring has to provide growth for both the mentor and the protégé. Mentoring must be a part of the mentor's research objectives and business plan. Depending on the mentor, there could be more than one protégé at a time. The vehicle must give the mentor freedom to be creative in doing research work, in aligning their tasks, and providing opportunity to do research.

Mentoring takes resources, and both the mentor and protégé must be committed to funding the effort or creating the resources that are required. Examples of vehicles/platforms include:

1. Independently funded research groups such as PBSRG.
2. The U.S. State Department Fulbright Scholar Program.
3. CIB working commissions.
4. Government or privately funded research projects.

Increasing the number of organizations that are cross linked or overlaid will encourage the activities which are required for research based activities and therefore make the mentoring of the protégé' simpler and more successful.

5.2 Identify Performance Measurements of the Mentorship Program

The performance measurements of the mentorship program include:

1. Number of years in the program.
2. Number of years to get PhD.
3. Number of years to senior lecturer position.
4. Number of years to full professor.
5. Number of refereed journal papers.
6. Number of refereed conference papers.
7. Number of significant contributions to international research groups.
8. Number and amount of grants.
9. Number of successful research tests.
10. Number of research based graduate classes.

The performance measurements will be documented in a risk management report that the protégé' documents and periodically reviews with the mentor.

6. CASE STUDY OF SUCCESSFUL MENTORSHIP PROGRAM

The proposed case study of the mentorship program involves using a base study case at PBSRG, a test at the PM section in the Civil Engineering Department, a research platform in Botswana between industry/UB academics, the University of Botswana PM section, and the CIB W117 Using Performance Information in Construction. The mentor, who is also the FS, has the following credentials:

1. Years in the program: 16 years	3. Years to Sr. lecturer position: 6 years
2. Years to get PhD: 3 years	

4. Years to full professor: 11 years	12. Industry presentations: 400
5. Refereed journal papers: 23	13. Significant contributions to international research groups: 5 (created CIB TG 61, W117, Dutch platform (15 tests in 2008), Botswana platform (2009), Movement to Finland in 2002)
6. Refereed conference papers: 125	
7. Grants: Over 100	
8. Amount of grants: \$7.1M	
9. Research tests: 600	
10. Successful research tests: 588	
11. Research based graduate classes: 3	

The mentor requested the assistant professor to join PBSRG, and to be mentored as a protégé. The protégé' has the following measurements in the past four and a half years:

1. Number of international/industry organization achievements: 5
 - Secretariat of one of the most successful CIB TG (TG61), and coordinator of W117 Performance Measurement in Construction.
 - Coordinator/assistant editor of CIB W117 journal.
 - Director, Facility Management Research Institute, sponsored by General Dynamics C4 Systems.
 - Creator of the graduate Facility Management / Project Management (PM) program at ASU.
 - Recognized as a star partner by both the International Facility Management Association (IFMA) and the Project Management Institute (PMI).
 - 2008 Outstanding Teacher Award from ASU.
 - Coordinated the W92 Construction Procurement International conference in 2005
2. Research activity:
 - Funding: \$2.5M
 - Number of grants: 15
 - Number of research tests: 125+
 - Project manager of ASU implementation of PIPS/IMT processes for major services including food services, IT networking, furniture, sports marketing services, document control/copy services, and the recreation center aerobic equipment contract. ASU efforts brought the university \$100M in additional investments due to the implemented technology.
 - Doubled PBSRG funding to \$1M/year in 2008
 - Number of research based graduate courses created: 3
 - Number of graduate students mentored (past/present): 17/22
 - Peer reviewed publications: 70
 - Book chapters: 8

This is the benchmark case of mentoring. It required research based mentor and protégé, dominant technology that changes the industry, and research based graduate education. The lack of any one of the elements will derail the results of the mentoring to increase research activity.

7. FINDINGS/CONCLUSIONS OF ONGOING MENTORING OF UB FACULTY

The FS has been at the UB of four trips (a month per trip) over an academic year. It is the FS most intensive effort in mentoring. The unique challenges include:

1. UB program is developing.
2. The Country of Botswana is a developing third world country.
3. Resources are scarce.
4. Faculty are difficult to hire.
5. More regimented than in the U.S.
6. Expectations of the faculty were not as high as mentor's.
7. Constraints to innovation due to lack of advanced graduate research structure are abnormally high for FS's mentoring attempts.

The following are the achievements:

1. Arizona State University and the University of Botswana are signing a Memorandum of Understanding (MOU.)
2. Defined a structure for a research based graduate program.
3. Converging the protégé's PhD topic, research tests, and graduate level research classes. The classes being targeted due to the protégé's being responsible for the classes include PM: Assessment, Monitoring, and Evaluation; PM Risk Management; PM Quality Control/Safety, and PM Procurement. Three of the protégés are seeking PhD under mentorship of FS.
4. Arrangements are being made for continued mentorship of protégés.
5. Running research tests for three major clients (University of Botswana IT, Bank of Botswana, and U.S. Embassy).
6. Developing a research platform with industry participants, UB mentored lecturers, and graduate students.
7. Created the Nelson Powder Memorial Research Fund (\$25K US), to assist the mentoring effort for the next five years.
8. Creating CIB W117 working commission platform at UB.
9. Creating weekly risk reports for each protégé' which forces preplanning and risk management.
10. Publishing refereed conference papers (13), journal papers (3), and book chapters (1).

11. Coauthored new concepts: a new risk model and research based graduate courses/program.

The achievements could have been increased had the mentor stayed for a full year at the UB. Mentoring by distance is more difficult. Technology was used to close the distance (Skype and email), but distance was certainly a constraint. The achievements exceeded the expectations of the UB faculty. These results are heavily dependent based on the efforts and vision of the mentor. The mentor had a strategic plan at the start, was constantly measuring the results and risk to success, and took what seemed to be more aggressive actions than what a normal visiting professor would do. The FS used over \$20K of PBSRG funding to ensure the success of the project.

8. CONCLUSION/RECOMMENDATIONS

There is a lack of research based (research that changes the industry practices) professors in the project management (PM) and construction management (CM) specialty areas. There is a need for a mentoring model which assists universities create the research based approach. PBSRG at ASU has been developing and testing such a model. It has been extremely successful. The mentoring model has been tested at different universities with relative results. Through the sponsorship of the Fulbright Scholar (FS) program, the latest test is at the University of Botswana (UB.) The mentoring model has been modified and improved. The results at the UB have exceeded expectations. Universities in other countries have been requesting the technology and the mentoring model. The major problem in using the mentoring model to increase research activity is the misunderstanding that the mentor has to be research based. The concept of the alignment of research activity, research based graduate education, and research expertise/technology of the protégés is logical but the mechanism and format has been not well understood. The authors are proposing that the only way to overcome such an obstacle is the creation of a mentoring program which identifies potential future professors, and exposes them to a mentoring program led by research based professors. The authors also recommend that to give access to more universities to the potential of the research based mentoring model, the universities must realize that there is such a program, more research efforts must focus on the model, and more lecturers must be made aware of the opportunities of a research based model. One of the problems is that the graduate education/research community has not been exposed to such a model. The program has already been expanded to a "Young Guns" program in the worldwide CIB W117 working commission.

Those seeking participation should contact the author at dean.kashiwagi@asu.edu.

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THE CORRELATION BETWEEN MATHEMATICS SYMBOLS AND PERFORMANCE IN SELECTED SUBJECTS: A CASE STUDY

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ABSTRACT

Purpose

The purpose of this paper is to examine the relationship between a student's Grade 12 final mathematics examination symbols and the subsequent performance in selected 1st year National Diploma (ND): Building subjects and in so doing establish the relationship.

Methodology

A review of mathematics history precedes a comparison of 1st year ND: Building students' Grade 12 results and their subsequent performance in selected subjects over a three-year period. Tables are used to summarize and display the data. A further inferential statistical analysis generated additional statistics relative to the data.

Findings

Results indicate that the failure rate of 1st year ND: Building students is consistently high. Furthermore, perceptions with respect to the probability of a student with either an A, B or C mathematics symbol passing selected subjects, is no better than those with a D, or E symbol or N3 certificate.

Research limitations

Notwithstanding that this research is limited to three cluster samples over a three year period at one University of Technology the results indicate that similar analyses should be undertaken at other institutions in order to validate or repudiate these preliminary findings.

Practical implications

Historically Grade 12 mathematics has been a prerequisite for the ND: Building programme, however, a high symbol does not guarantee that the student will pass selected subjects. The question is thus posed, “Is a pass in Grade 12 Mathematics essential for a career in building?”

Original Value

Contrary to the perception that good marks in Grade 12 Mathematics translate into good marks at tertiary education level, the result of this case study indicates otherwise.

Keywords: Mathematics, ND: Building, tertiary education, construction management.

1. INTRODUCTION

Considerable emphasis is placed on mathematics as a pre-requisite for a tertiary built environment education qualification. This paper establishes the relationship between Grade 12 final mathematics examination symbols and the subsequent performance of 1st year National Diploma (ND): Building students in selected subjects.

An explanation of the role of mathematics in everyday life is followed by a precise of the history of mathematics with the contributions made by luminaries highlighted. The history of mathematics is traced from the discovery by paleontologists 70 000 year ago, of geometric patterns on cave walls and the ‘Ishango’ bone, through the Harappan civilization, North India and Pakistan, and the Shang Dynasty of China. An overview of Babylonian, Egyptian and Verdic mathematics provides further insight into the imperative of mathematics as an aid to analytical thinking, deductive reasoning and logic.

Milestones in the mathematics history such as the oldest mathematical work; the expression of relationships by means of symbols; the publishing of the first real mathematics book and the standardization of mathematical terms and notations precedes a review of the increasingly abstract mathematics of the 19th century. The 20th century saw mathematics become a major profession.

A discussion of the contrasts between mathematics in education versus mathematics in the workplace dispels any notion that mathematics should not be a pre-requisite for a tertiary built environment education.

An excerpt from a speech at the National Mathematics Week emphasizes that mathematics literacy is an essential part of a toolkit that underpins engineering and the natural sciences and provides additional evidence as to the importance of mathematics.

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2. LITERATURE REVIEW

2.1 Everyday Mathematics

Steen (2004) cites Hammond (1978) as stating that mathematics is our invisible culture. Everything we use on a daily basis, from automobiles to computers, would not be possible without mathematics. Furthermore, an economy; defence system; social security insurance and voting to name a few all depend on mathematical models and quantitative habits of mind. The most common uses of mathematics are routine applications that are now part of all kinds of jobs. Eight key areas are testing products, managing investments, monitoring performance, anticipating change, controlling processes, designing systems, interpreting data and minimizing total costs.

2.2 The History of Mathematics

The discovery by palaeontologists of geometric patterns scratched on the ochre rock walls of a cave in South Africa approximately 70 000 years ago indicates some knowledge of elementary mathematics and of time measurement based on the stars (Henahan, 2002).

The 'Ishango' bone, found near the headwaters of the Nile River is interpreted as the earliest known demonstration of sequences of prime numbers and of ancient Egyptian multiplication. The megalithic monuments in Egypt, England and Scotland incorporate geometric ideas such as circles, ellipses and Pythagorean triples in their design.

The Harappan civilization of North India and Pakistan (c.3000 – 2600BC) developed a system of uniform weights and measures that used the decimal system, an advanced brick technology which utilized ratios, streets laid out in perfect right angles, and a number of geometrical shapes and designs including cuboids, barrels, cones, cylinders and drawings of concentric and intersecting circles and triangles. Mathematical instruments included an accurate decimal ruler with small and precise sub-divisions, a shell instrument that served as a compass to measure angles in multiples of 40 – 360 degrees, and an instrument for measuring the position of stars for navigational purposes.

The earliest extant Chinese mathematics dates from the Shang Dynasty (c.1600 – 1046BC) and consists of numbers scratched on a tortoise shell. This was the most advanced number system in the world and allowed calculations to be carried out on the *suan pan* or Chinese abacus. Babylonian mathematics named thus due to the central role of Babylon as a place of study, refers to any mathematics of the people of Mesopotamia (which is now Iraq). Babylonian mathematics was written using a sexagesimal (base-60) numeral system from which the modern day usage of 60 seconds in a minute, 60 minutes in an hour and 360 (60 x 6) degrees

in a circles is derived. However, they lacked the equivalent of a decimal point, and so the place value of a symbol often had to be inferred.

The oldest mathematical text discovered is an Egyptian Middle Kingdom papyrus dated c.2000 – 1800BC known as the Moscow papyrus. A particularly interesting example is of a problem with a method for finding the volume of a frustum: 'If you are told: A truncated pyramid of 6 for the vertical by 4 on the base by 2 on the top. You are to square this 4, result 16. You are to double 4, result 8. You are to square 2, result 4. You are to add the 16, the 8 and the 4, result 28. You are to take one third of 6, result 2. You are to take 28 twice, result 56. You will find it right.' (Wikipedia, 2009). The modern scientific notation to calculate the volume of a frustum is:

$$\frac{a + \sqrt{a+b} + b}{3} \text{ where } a = \text{area of base and } b = \text{area of top.}$$

Another major Egyptian mathematical text is the Rhind papyrus (c.1650BC), an instruction manual in arithmetic and geometry which precedes the Berlin papyrus (c.1300BC) which shows that ancient Egyptians could solve a second order algebraic equation.

Ancient Indian mathematics, known as Verdic mathematics began in the early Iron age (c.900BC – AD200), with the *Shatapatha Brahmana* which approximates the value of π to 2 decimal places. The *Sulba Sutras* were geometry texts that used irrational numbers, prime numbers, the rule of three and cube roots; computed the square root of 2 to 5 decimal places; gave the method for squaring the circle; solved linear and quadratic equations; developed Pythagorean triples algebraically and gave a statement and numerical proof of the Pythagorean theorem.

Greek mathematics - thought to have begun with Thales (624BC) and Pythagoras (582BC) who were probably inspired by the ideas of Egypt, Mesopotamia and India - (c.550BC – AD300), was more sophisticated than the mathematics that had been developed by earlier cultures as they used deductive reasoning and logic to derive conclusions from definitions and axioms.

The oldest mathematical work to survive the book burning in China (c.212BC) is the *I Ching* which used trigrams and hexagrams composed of broken and solid lines called 'yin' (female) and 'yang' (male) respectively. After the book burning, the Han dynasty (c.202BC – 220AD) produced the *nine chapters* on the mathematic art.

It consists of 246 word problems, involving agriculture, business, employment of geometry to figure height spans and dimension ratios for Chinese pagoda towers, engineering, surveying triangles and π . It also made use of Cavalieri's principle on volume more than a thousand years before Cavalieri proposed it in the West. It created mathematical proof for

Pythagoras' Pythagorean Theorem, and mathematical formula for Gaussian elimination.

Further developments first made in China and only much later known in the West, include negative numbers, the binomial theorem, matrix methods for solving systems of linear equations and the Chinese remainder theorem. The Chinese also developed Pascal's triangle and the rule of three long before it was known in Europe.

Medieval European interest in mathematics (c.500 – 1400) was driven by the belief that mathematics provided the key to understanding the created order of nature, justified by the biblical passage that God had 'ordered all things in measure, and number, and weight' (Wisdom 11:21).

In Europe, at the dawn of the Renaissance (c.1400 – 1600), mathematics was still limited by the cumbersome notation using Roman numerals and expressing relationships using words, rather than symbols: there was no plus sign, no equal sign, and no use of x as an unknown.

In 16th century mathematics unprecedented advances were made and mathematical developments came swiftly, contributing to and benefiting from contemporary advances in the physical sciences. Advances in printing aided the publishing of the first real mathematics book *Euclid's "Elements"*.

The 17th century saw an unprecedented explosion of mathematical and scientific ideas across Europe. Galileo, an Italian, observed the moons of Jupiter in orbit about that planet. Isaac Newton, an Englishman, discovered the laws of physics and brought together the concepts now known as the calculus.

Leonard Euler was arguably the most influential mathematician of the 1700's. He standardized many modern mathematical terms and notations and popularized the use of the Greek letter π . He made numerous contributions to the study of topology, graph theory, the calculus, combinatorics, and complex analysis.

Throughout the 19th century mathematics became increasingly abstract. A study of hyperbolic geometry found that the uniqueness of parallels no longer holds. In this geometry the angles in a triangle add up to less than 180 degrees. A study of elliptical geometry also showed that no parallels can be found and that the angles in a triangle add up to more than 180 degrees.

The 19th century saw the beginning of abstract algebra. In Boolean algebra the only numbers were 0 and 1 and in which, famously, $1 + 1 = 1$. Boolean algebra is the starting point of mathematical logic and has important applications in computer science.

The 20th century saw mathematics become a major profession and jobs are available in both teaching and industry. In earlier centuries there were few creative mathematicians in the world at any one time.

In a speech to the International Congress of Mathematicians, a list of 23 unsolved problems spanning many areas of mathematics was set out and formed a central focus for much of 20th century mathematics. Today, 10 have been solved, 7 are partially solved, and 2 are still open. The

remaining 4 are too loosely formulated to be stated as solved or not (Wikipedia,2009).

2.3 Mathematics in Education versus Mathematics in the Workplace

Mathematics is certainly not invisible in education. Ten years of mathematics is a prerequisite for the ND: Building programme, however numerous reports have documented deficiencies in mathematics education.

The contrast between mathematics in school versus mathematics at work is especially striking (Forman and Steen, 1998).

Mathematics in the workplace makes sophisticated use of elementary mathematics whereas in the classroom, elementary use is made of sophisticated mathematics.

Work-related mathematics is rich in data, interspersed with conjecture, dependent on technology, and tied to useful applications. Work contexts often require multi-step solutions to open-ended problems, a high degree of accuracy, and proper regard for required tolerances.

According to Steen (1988) and Devlin (1994), mathematics is the science of patterns and the ability of computers to generate and organize data has opened up an entire new world of mathematical analysis. Much of traditional mathematics is now embedded in silicon, so training people to implement these methods with facility and accuracy is no longer as important as it once was. However, the importance of other parts of mathematics, such as statistics, number theory and discrete mathematics has increased due to technology.

Although algebra and calculus may be the dominant goals for school mathematics, in the real world mathematical activity usually begins not with formulas but with data.

Measurements form the source data for mathematical practice. Traditionally, and philosophically mathematics has been thought of as a science of ideal objects, numbers and shapes. In practice, it is about solving problems that involve measured quantities that are never perfectly precise.

The Deputy Minister of Science and Technology, Derek Hanekom (2006) at the closing ceremony of National Mathematics Week reasoned that there is a school of thought, which argues that all human beings are born, from a mathematical perspective, at least potentially, functionally literate. On the other hand, there are many who continue to argue for an exclusive notion of mathematics. They view mathematics as a complex language that can only be understood and used by a select few. The differences are not those of differing talent but different levels of access and exposure to realize that potential.

Mathematics literacy in such day to day processes as (logical) reasoning, counting, financial planning, measurement and how things

relate to each other, cannot be relegated to the “nice to have” category – it is an essential feature of empowerment of our citizens in a modern and progressive society. We also need to grow those individuals who will use mathematics as part of the toolkit that underpins engineering and the natural sciences. Excellence in the full access to mathematics teaching and learning is something we should all aspire to and seek to instil in young people, educators and in our society at large.

3. METHODOLOGY

A review of mathematics literature inculcates numerous benefits to those that are proficient in mathematics and provides credibility as to the role mathematics has played and is presently playing in a developing world. However, a consistent observation during interviews and testing of ND: Building candidate students was poor mathematical application skills.

In order to determine whether this observation was justifiable, data relative to 1st year students’ mathematics symbols and subsequent performance in the 1st year subjects of Quantity Surveying and Applied Building Science was collated and analysed for a three-year period. It is noteworthy that this comparative analysis is of the defunct standard grade and higher grade mathematics, which incidentally has now been replaced by the not much vaunted mathematics literacy.

Tables are used to reflect the number of students in each Grade 12 mathematics symbol category, the pass rate and cumulative pass rate of two subjects by students over a three-year period.

The Grade 12 mathematics symbols reflected in the tables refer to standard grade mathematics. In the cases where students had a higher grade symbol it was converted to a standard grade symbol according to the Swedish Scale.

Chi-square and Cramer’s V tests were undertaken to determine whether the hypothesis – a good mathematics symbol implies a pass in mathematically related subjects – may be accepted or alternatively rejected.

4. FINDINGS

Table 1 categorizes the number of students enrolled for the 1st year quantity surveying subject, for the first time, according to the symbol they obtained for mathematics in Grade 12.

Table 4.1: The correlation between Grade 12 Final Examination Mathematics Symbols and the pass rate in Quantity Surveying

Grade 12 Maths	Quantity Surveying											
	2006			2007			2008			2006 - 2008		
	n	Pass	%	n	Pass	%	n	Pass	%	n	Pass	%
A	0	0	-	1	0	0.0	7	4	9.1	8	4	3.8
B	2	0	0.0	5	2	6.5	9	3	6.8	16	5	4.8
C	6	1	3.3	8	0	0.0	8	3	6.8	22	4	3.8
D	12	6	20.0	7	0	0.0	10	4	9.1	29	10	9.5
E	8	4	13.3	4	1	3.2	8	3	6.8	20	8	7.6
F	2	0	0.0	0	0	-	0	0	-	2	0	0.0
N3-N6	0	0	-	6	2	6.5	2	0	0.0	8	2	1.9
Total	30	11	36.7	31	5	16.1	44	17	38.6	105	33	31.4

Of the 105 students enrolled over a three-year period, less than a third or only 33 passed, and this after a selection process in which historically only a third of those who applied, are accepted. The poorest pass rate was in 2007 where only five students passed. Another disturbing statistic with this group is that of the 21 students with either an A, B, C or D Grade 12 mathematics symbol, only two passed.

Table 2 reveals that of the 105 students enrolled for the subject Applied Building Science over a three-year period slightly more than half failed (52.4%).

Table 4.2: The correlation between Grade 12 Final Examination Mathematics Symbols and the pass rate in Applied Building Science

Grade 12 Maths	Applied Building Science											
	2006			2007			2008			2006 - 2008		
	n	Pass	%	n	Pass	%	n	Pass	%	n	Pass	%
A	0	0	-	1	0	0.0	7	3	6.8	8	3	2.9
B	2	2	6.7	5	4	12.9	9	8	18.2	16	14	13.3
C	6	3	10.0	8	3	9.7	8	7	15.9	22	13	12.4
D	12	8	26.7	7	2	6.5	10	5	11.4	29	15	14.3
E	8	2	6.7	4	0	0.0	8	0	0.0	20	2	1.9
F	2	0	0.0	0	0	-	0	0	-	2	0	0.0
N3-N6	0	0	-	6	3	9.7	2	0	0.0	8	3	2.9
Total	30	15	50.0	31	12	38.7	44	23	52.3	105	40	47.6

The poor pass rate reflected for 2007 gives credibility to the findings on the previous table for the same period. Notwithstanding that the pass rate for applied building science hovers around 50% in 2006 and 2008 it is a disturbing statistic given that the subject is presented at an elementary level the pass rate is poor.

The combined findings in Table 3 justify the interpretation of the hypothesis, namely: It cannot be accepted as true that a good Grade 12 mathematics symbol implies a pass in mathematically related subjects.

Table 4.3: The correlation between Grade 12 Final Examination Mathematics Symbols and the pass rate in selected subjects

Grade 12 Maths	Quantity Surveying											
	2006			2007			2008			2006 - 2008		
	n	Pass	%	n	Pass	%	n	Pass	%	n	Pass	%
A/B	2	0	0.0	6	2	6.5	16	7	15.9	24	9	8.6
C/D	18	7	23.3	15	0	0.0	18	7	15.9	51	14	13.3
E/F/N3-N6	10	4	13.3	10	3	9.7	10	3	6.8	30	10	9.5
Total	30	11	36.7	31	5	16.1	44	17	38.6	105	33	31.4

Grade 12 Maths	Applied Building Science											
	2006			2007			2008			2006 - 2008		
	n	Pass	%	n	Pass	%	n	Pass	%	n	Pass	%
A/B	2	2	6.7	6	4	12.9	16	11	25.0	24	17	16.2
C/D	18	10	36.7	15	5	16.1	18	12	27.3	51	28	26.7
E/F/N3-N6	10	2	6.7	10	3	9.7	10	0	0.0	30	5	4.8
Total	30	15	50.0	31	12	38.7	44	23	52.3	105	50	47.6

A comparison of the total number of students passing either of the two selected subjects in any given year of study reveals a consistent trend, despite an improvement in the pass rate in applied building science.

To further test the correlation between Grade 12 mathematics symbols and the probability of passing selected subjects Table 4 provides the Chi-square with Cramer's V results. The p value of .659 is greater than the critical value of 0.526 thus it may be concluded that the correlation between a good mathematics symbol and the probability of passing differs significantly (Bernstein, 2005). The Chi-square result espouses this conclusion relative to quantity surveying. Given that a Cramer's V result could not be obtained relative to quantity surveying the aforementioned conclusion is further espoused.

Table 4.4: Chi² test results (d.f. = 2) with Cramer's V

	Chi ²	P	V
Quantity Surveying	0.84	.659	-
Applied Building Science	15.56	<.0005	0.38 medium

The results in Table 4 portrays that there is medium support to the probability of passing applied building science.

5. CONCLUSION

Given the unacceptable low standard of the mathematics paper as stated by the Concerned Mathematics Educators (CME) there is no certainty that the students emerging from school are capable of thinking and may not be able to make the transition to tertiary education, let alone thrive (Hardegen, 2009).

The aforementioned sentiment is substantiated by the poor pass rate for the 1st year level subjects of quantity surveying and applied building science where the average pass rate over a three-year observation period was 31.4% and 47.6% respectively. It is worth mentioning that this

research entailed students with standard grade mathematics which taught some of the principles of mathematics at an elementary level. However, future research on this subject will require the results of mathematical literacy, which has superseded standard and higher mathematics. It is alleged that there is a chasm between mathematics and mathematical literacy, the standard is poor and the door to further education is limited.

An explanation of the results of the survey were transcribed from a prominent mathematics educator as follows: "Standard Grade mathematics was a 'watered down' mathematics at any rate. The sample is relatively small – many students might have come from schools with poor teachers so their foundations are questionable – or they find with better teaching at tertiary level, they find their feet,"

6. RECOMMENDATIONS

The National Council of Teachers of Mathematics (NCTM, 2000) produced a document entitled Principles and Standards for School Mathematics organized around five 'content' standards namely; number and operation, algebra, geometry, measurement, data analysis and probability; and five 'process' standards namely; problem solving, reasoning and proof, communication, connections and representations.

It is acknowledged that fixing school Mathematics requires attention to many significant issues such as teacher competency, recruitment, salaries and performance; class size and classroom conditions; alignment of standards with textbooks and tests; and consistent support by parents, professionals and politicians.

A Mathematical education should prepare students to deal with the kinds of common situations in which a mathematical perspective is most helpful. Common examples include scheduling, modelling, allocating resources, preparing budgets and learning to use the tools of modern technology.

Hardegen (2009) reports that the CME – a group of 90 mathematics teachers from around the country – have sent an open letter to the Department of Education and its minister, Naledi Pandor, expressing their grave concern that the 2008 examinations had been watered down, widening the gap between school and university for the top learners.

The CME has however authorised an interim solution that will help to close the gap between school and university mathematics as the current structure and assessment system is making mathematics less accessible for the weaker learner and not challenging enough for top learners.

The CME recommends that in 2009 all mathematics students write the mathematics papers one and two so that students with lesser mathematical ability will be able to prove that they have a basic understanding of the mathematical principles. Learners with a higher mathematical ability will

also write papers one and two but their real assessment will be contained in the optional paper three, which will test the conceptual ability of learners.

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DEVELOPING A RESEARCH BASED MPM GRADUATE PROGRAM

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ABSTRACT

Purpose of this paper

Graduate programs in project management face several obstacles in becoming world class research based graduate programs. The University of Botswana, with the assistance of a Fulbright Scholar (FS) from a progressive research based program in the U.S., is trying to change their graduate program model to become more research-based. This paper highlights the issues that must be overcome.

Design/methodology/approach

This research is attempting to define the differences that must be bridged, a process to bridge the differences, and is running a case study test at the University of Botswana to test the hypothesis.

Findings

The obstacles for the development of the graduate program include being the philosophical difference between an educational/training program and a research based program, a lack of a research based structure which motivates research activity, a lack of instructors with innovative project management or research experience, graduate students who are used to educational/training requirements and not applying "new" theoretical based concepts to improve their workplaces, and a lack of peer reviewed publications and funding resulting from thesis and dissertation work.

Value

The proposed mechanism would provide a model for the University of Botswana as well as other graduate programs in similar circumstances to transform into a world class research based program.

Keywords: Graduate project management education, new research based model. Professor development, research based faculty.

1. INTRODUCTION

This paper proposes that academic graduate programs in construction and project management may not have a structure that is conducive to research which impacts industry practices. Many graduate academic research programs have difficulty with creating and teaching leading edge practices which have the potential to change the industry (Egbu et al., 2008). Graduate academic research programs also traditionally lack a research/industry platform or interface which are required to impact industry practice (Green, 2001). Therefore, graduate programs usually are extension of undergraduate classes or certification classes, teaching students current industry practices with more technical details. This forces the graduate programs to follow the industry and reinforce the status quo. The authors propose that as a result, graduate students are conditioned to learn about current practices and would therefore reinforce the status quo. The graduate programs would then proliferate the environment of training instead of research.

The authors also propose that this makes it extremely difficult for graduate program faculty to do research work (research tests and publications). This in turn may result in graduate students having difficulty doing innovative thesis work that will help the industry to change. The authors propose that in order for graduate programs to be research based, the structure of the program must change. The study attempts to validate the authors' proposals and gives a potential solution to the issues. The study is a current test at the University of Botswana to make the graduate project management curriculum more of a research based curriculum.

1.1 Problem

The current project management industry in Botswana has a problem of minimizing risk (not delivering on time, on budget, and meeting client expectations) (Ssegawa et al., 2007). The industry is currently using a reactive model which depends on decision making and management and control of the vendor (Rwelamila, 2000; Lionjanga, 2003). The delivery of services currently uses contract documents that: attempt to control the contractor/vendor; do not transfer risk and control to the expert vendors;

and as best value test results in the United States have shown, have been protecting the wrong party (Ali, 2005). The authors propose that the change to a more effective project management model is a paradigm shift more than a legal issue or a change in processes. The authors further propose that a paradigm shift involves education and research tests that can best be accomplished in a graduate academic setting. However, there is an ongoing challenge with traditional graduate education programs. Even though universities are requiring educators to be involved with research activities as a part of tenure and promotion, many construction/project management graduate programs do not have a mechanism, structure, and incentives to assist researchers do repeated hypothesis testing to solve the industry issues. Research at many universities, are funded by government research groups, with the research never being implemented in the industry (Kashiwagi, 2008).

Recently, using the US State Department Fulbright program, the University of Botswana Masters of Project Management (MPM) program is currently studying this problem. The effort had two objectives: 1) To upgrade the curriculum to cutting edge project management concepts and 2) To create a research/industry interface that would assist in helping the graduate program as well as the industry.

The MPM program identified the Performance Based Studies Research Group (PBSRG) at Arizona State University (ASU) due to: 1) Project management expertise across a range of industries and 2) Research capability and results which impacted the industry. The current UB MPM program is a couple of years old, and is a traditional PM program using textbooks as the major source of information in the curriculum. This results in the MPM curriculum to maintain the status quo. Textbooks require at least two years period to write and publish. The average age of the UB recommended textbooks is 6.7 years (Botswana MPM, 2008). The traditional approach to PM graduate education forces faculty to become primarily educators instead of researchers. They must first learn the existing body of knowledge. Their objective is to be able to teach from the existing body of knowledge. With their numerous other administrative tasks, forced to learn the body of knowledge, and with a lack of experience (most graduate programs require instructors to have a graduate degree before they can teach), they must become educators instead of researchers. However, for tenure and promotion, universities are requiring academic faculty to have research activities. The research requirement and the graduate education requirements are not aligned. The graduate program faculty is therefore faced with a monumental task, how to do research and teach at the same time. The UB MPM program instructors are faced with this problem.

From numerous classes and meetings with MPM graduate students (100% are working in the industry), the authors have also identified that MPM graduate students have a difficult time doing creative, analytical, research based activities which will change the industry.

The current project management model being used in the Botswana construction industry is a management, and control based UK/US model which is proposed by both major project management industry organizations (PMI and IPMA). From investigations into UB Finance and Information Technology (IT) groups, government agencies and private enterprises in Botswana, and in different industries participating in research at ASU, the authors propose that many industries implement the management, control, and direction based project management.

The authors have identified the major challenges in moving the UB graduate program from an education/training based program to a research based program as including:

1. Changing the objectives of the program from education/training of existing practices to creating new practices which will assist the industry in improving project management performance and value.
2. Changing the graduate program structure from being academic teaching/training textbook driven to conceptual/theoretical based hypothesis and testing research.
3. New concepts and research test results need to replace the current traditional body of knowledge of the industry as the major source of knowledge.
4. Transforming the graduate education instructors from being educators to researchers/industry experts.
5. Creating a new atmosphere where graduate students become resources for new knowledge and the application of technology transfer that impacts the industry instead of students being educated/trained through a regimented program of traditional assignments and exams.

2. HYPOTHESIS AND METHODOLOGY

The hypothesis of this paper is to validate in a case study that the UB MPM graduate program paradigm is education based and needs to make the movement toward being research based. The hypothesis is to also develop a methodology to help move the curriculum from being textbook based, teaching existing practices and concepts, to teaching new innovative concepts which have the potential of bringing change and value to industry practices. The hypothesis also includes the concept that changing the program objectives and structure is as important as the new theoretical concepts that need to be taught. The change requires the faculty, graduate program, and graduate students to have a paradigm shift to align the efforts of the instructors, the program, and the students. The testing of the hypothesis can be done by simplistic measurement of program changes in research activity and acceptance of the concepts by program faculty.

The research methodology will use the following steps:

1. Identify a high performing research based program and performance measurements.
2. Identify the current research capability at UB PM section.
3. Identify differences between the successful benchmark research program from the traditional program.
4. Identify the state of the graduate students at UB in terms of being open to new concepts.
5. Propose changes that can transform an education based unit to a research based unit.

The effort is ongoing and the results will continue to be documented. This paper covers what has transpired so far.

2.1 High Performing Research Based Graduate Program

The extreme case of a research based graduate program is the ASU PBSRG facility management/project management masters degree program. The performance measurements of the program include the following over the past 15 years:

1. Number of research tests run with industry: 636 tests \$2.4B of delivered services
2. Number of refereed publications (conference and journal papers): 160
3. Number of research grants where innovative PM processes are tested: 174
4. Amount of research grants: \$7.4M US
5. Number of collaborations between researchers and research partners in doing research testing: 636
6. Number of graduate courses that include creative research concepts: 10
7. Number of thesis that correlated with research efforts that are impacting the industry: 25
8. Number of presentations to the industry with the sole purpose to request participation in research efforts that will impact the current PM practices: 50/year (400+ total over 14 years)
9. Number of students requesting participation in a section research effort that involves research testing: 25

These measurements will be used on the UB PM section to identify level of research and capability to do research.

3. CASE STUDY OF UB PM SECTION RESEARCH ACTIVITY

The objectives of the authors were to investigate the following at the UB project management (PM) section: 1) Research activity level of the current faculty that changed the industry practices (number of research projects, number of refereed papers, and amount of research funding) and 2) Measure the ability of students to do creative research work which impacted industry practice.

There are currently five members of the UB PM section in civil engineering, excluding the Dean of the Faculty of Engineering (FET). There is currently no mechanism in place that will allow faculty to buy out their time and do research work. Due to the shortage of instructors, and the inability to fill slots, faculty are being asked to teach three classes a semester, and also fulfill administrative duties, leaving no time for research work. The issue is also confused by the problem of identifying what is research work, the difficulty in getting research funding, the lack of an industry/academic research platform to plan meaningful research testing, and the lack of a strategic research plan which changes the industry practice. The result is that faculty must concentrate their research activity on trying to identify existing conditions of the industry through surveys or data collection. Each research effort becomes an independent, one-of-a-kind research activity, requiring an extremely high level of effort. This explains why construction research within the industry is nonperforming, with very few tested solutions. The UB PM section has not started research or performance measurements on research activity for the past year (Botswana MPM, 2008).

3.1 Identify Differences in the Operating Structure of the Two Units

The FS scholar identified the major differences between the two units:

1. PBSRG created an "out of the box" dominant technology, which brought the attention of the client and contractor industry funding (Kashiwagi, 2009). PBSRG also has a strategic plan to continue to improve the dominant technology.
2. PBSRG had a buyout structure that allowed the researcher to concentrate on research. The visionary leader developed a structure whereby his research funded his staff. The internal administrative/research structure was created by the funding. The external university structure already existed (Kashiwagi et al., 2008).
3. PBSRG graduate program objectives are more focused and synergistic, aligning teaching with research tests and publications.
4. PBSRG aligned research expertise with a "created" curriculum that continued the transformation of the industry and aligned with the

strategic plan for change. PBSRG developed research based graduate courses which reinforced the research, assisted the research, and allowed theoretical development to happen simultaneously with prototype testing.

5. PBSRG research based environment is different from traditional academic environments in terms of number and type of assignments, structure of classes, amount of effort of innovation/creativity vs traditional writing assignments on educational topics, and expectation (dominant impact rather than volume of work).

The dominant technology at PBSRG is the Performance Information Procurement System (PIPS) and the Information Measurement Theory (IMT). Dominant was defined as “easily recognized” by industry participants as having value. By definition, the IMT logic, was easily recognized as different, and much better than existing explanations. The early test results were so much better than existing practices, resulting in immediate industry interest. The dominance of the basic theory and results allowed minimal initial testing before a momentum began to develop. The amount of analysis work was also minimized by the consistency of the results and the dominant logic. The PIPS/IMT results were not 2% better, but increased 30% - 50% in efficiency, level of client satisfaction, and reduction of change orders (Michael et al., 2008; Sullivan et al., 2005; Kashiwagi et al., 2002). This dominance of results, minimized the number of tests, and detailed analysis required to convince other research partners to start testing.

The lead professor in the effort sacrificed potential salary and consulting fees to start the research group. The example of the leader is crucial in establishing the credibility of the research group. Also, everyone in the group sacrificed personally for the effort. This also helped to build the credibility of the research effort. In building his staff, the lead professor ensured that his staff had the same motivation to add value and understanding to the industry. Over 15 years, the research logic has identified that the alignment of visionary personnel and personnel who were capable of “thinking of others” and creating “win-win” situations was a critical component of the research faculty and staff. Other characteristics of the research staff were consistency, alignment, and an understanding of IMT. The IMT logic minimized the alternatives and resulted in focused and unified effort. Due to the dominance of the technology, PBSRG was able to develop a facility management/project management graduate program around PIPS/IMT. To sustain the research based education, the development of the basic theory of IMT, prototype testing of PIPS, and implementation of PIPS had to be conducted simultaneously. Dominant results were required to attract more graduate students and research partners. The PBSRG research thrust would have been very risky if the technology was not as dominant, and did not work as hypothesized.

The Fulbright Scholar (FS) from the PBSRG is being brought in for four months at the UB during the academic year 2008-2009 to achieve the above actions. The four months were broken down into four trips with the trips being spaced out over the academic year: August/September 2008, September/October 2008, January 2009, and April 2009. The following steps would be taken during the four periods to close the gap (previously identified differences) between UB and PBSRG graduate programs:

1. Introduce dominant technology in MPM655 class: Assessment, Monitoring, and Evaluation of the class, closely tracking to test the hypothesis of students, potential for research testing with the industry, and to build confidence in partnering faculty (Difference 1).
2. Alignment of the core team of faculty by asking for volunteers to work the effort as a part of their continuing education/dissertation and teaching responsibilities (Differences 4 and 5).
3. Assist in implementing PIPS/IMT in the graduate classes. Alignment of faculty led to the Procurement, Quality Control, and Risk Management class curriculums in addition to the MPM 655 class (Differences 3, 4, and 5).
4. Approach the industry to run tests using the research technology (Difference 2).
5. Convince faculty to align research expertise with curriculum. Alignment happened in four classes (Difference 3, 4, and 5).
6. Change the structure of graduate classes, from undergraduate type lecture/exam to less structure, shorter class periods, more discussion, more creative theoretical development and simpler approach to thesis. The approach to thesis would be to learn and apply simplistic theoretical concepts that would lead to improvement, presentation to organizations that delivered services, identification of unique constraints of organizations, and testing new technology in their unique organizations. If the students cannot do thesis showing dominant contribution, they do not graduate. Higher grades and research slots are given to students who show dominant contribution and not do more work (Difference 3, 4, and 5).

The success of the proposed strategic plan would be measured by the research program performance measurements. The FS used the dominant PIPS/IMT technology on both selection of the UB core team who would take over the research, and the students in the class. The FS identified the staff who:

1. Showed the most interest by assisting the FS in teaching, answering questions, and assisting in the MPM 655 classes.
2. Showed up to the industry presentations to learn.
3. Showed the most interest in working with the FS.

4. Volunteered to coordinate the efforts with the FS and helped run the research tests.
5. Spent effort to read the material, and implement the concepts in their MPM classes (procurement, risk management, quality control, and project assessment, monitoring, and evaluation).

Four of the five PM section faculty became involved in the effort, three of them more active than the others. Two of the faculty became very active, one becoming the lead researcher, and the other the assistant researcher. The three more active faculty, assisted the FS in the starting the research (presentations, research tests, teaching, and assisting the FS). The dominant technology was implemented in four different courses in the MPM graduate curriculum. The goals for the core research team are to have positive measurements in the performance categories by the end of the academic year 2008/2009 (goals already achieved in parenthesis):

1. Number of industry research tests: 4 (2)
2. Number of refereed publications: 7 (10)
3. Number of research grants: 2 (2)
4. Amount of research grants: \$25K (\$10K)
5. Number of collaborations between researchers and industry testing: 4
6. Number of graduate courses that include creative research concepts: 4
7. Number of industry impacting theses: 2
8. Number of industry presentations to request participation in research efforts that will impact the current PM practices: 6
9. Number of students requesting participation in a section research effort that involves research testing: 8

The faculty results show the potential of doing research. The next step is to identify if the graduate students can adjust to the research based philosophy. The FS used the MPM 655 class of 27 graduate students, 100% from the industry (no full time students), as a test to identify if an MPM typical class could meet the expectations/requirements of a research based class. The MPM 655 students had only seven class periods (instead of the full 14) with the FS, and seven classes with the UB faculty who were being trained in the research based program. The FS then hypothesized the expected return of a successful research based class from previous classes at ASU and other universities in the US and UK:

1. Of the 27 students, 10 percent (20 times better than the normal expectation based on the time spent with the students, and the lack of PM technical expertise in Botswana) would take the challenge of presenting the dominant technology and attempt testing the concepts in their own organization. Normally in a class or group of individuals, five tenths of one percent would test the system. The FS normally gives 50

presentations to 1,500 individuals per year. A very successful year is when eight clients test the system.

2. Ten percent of the class would structure their thesis on the technology (3 students).
3. The class would improve in understanding the new technology over the course of the class. The class would be measured on improved test scores (compared against the same class at ASU with the same exam in terms of average scores and percentage change in scores, and compared with average scores and change in score on industry concepts exam given to industry personnel).
4. The class would be asked to rate the performance of the class (1-10 ratings). The FS's ratings on classes is usually a 4.6 average.
5. At least 50 percent of the class would succeed in learning the theoretical concepts. This would be rated based on the following factors:
 - Improving their test scores.
 - Scoring above 60 percent on their final exam scores.
 - Improving their understanding of theoretically complex ideas.

4. PRELIMINARY RESULTS OF THE MPM CLASS EXPERIMENT

The following are preliminary results of the MPM 655 class test investigating if the MPM program students had the potential for being research based. A more detailed analysis will be published in a later paper. The following mechanisms were used to collect information:

1. Two multiple choice exams (160 questions) were given during the semester. Questions were conceptual in nature, with each question having up to 10 potential answers.
2. The exact same exams were given as a part of the final exam.
3. An industry questionnaire on industry practices, structure, and logic was given twice, at the beginning of the class and at the end.
4. The students are also asked to rate the class (1-10) on some of the features that make the class a research based class.

The preliminary results are as follows on the different student measures (number of students, percentage, expectation):

1. Did not pass with a 60% mark after the second time of getting the same exam: 9 (33%)
2. Did more poorly the second time on the same exam: 2 (7%)
3. Failed to increase by at least 10% on the second exam: 8 (30%)
4. Did more poorly on the second industry questionnaire: 3 (11%)
5. Total of students in the above four categories: 16 (60%)

6. The second exam average mark compared to the ASU class mark: UB: 64 ASU: 77 differential: 13 points (20% lower than ASU score)
7. The average increase in percentage compared with the ASU mark: UB: 16% ASU: 15% (1.3% higher differential for UB)
8. The average score on the industry concepts when compared to industry professionals in the US who were exposed to the concepts for a conference presentation: UB: 6.95 US: 6.88
9. The average rating of performance on the class (1-10, 10 being a good mark): 9.08 (4.54 on a 1 -5 rating scale) FS average mark over 15 years: 4.65

The class rating given by the students were rated from 1 – 10, 1 being totally disagree, 5 being don't know, and 10 being totally agree. The lowest ratings and the highest standard deviation were recorded for the following statements:

1. The class is more difficult than usual: average 5.05, standard deviation 3.5
2. Difficult to adjust to efficient and effective thinking due to normal methodology of very long and complete answers: average 6.23, standard deviation 3.4
3. Students in the class took half the class to just get adjusted to the different way of thinking: average 6.55, standard deviation 3.00

The preliminary student ratings show that the students were divided on the difficulty of the class, the difficulty in adjusting to the class, and many students took most of the class to learn the new way of thinking. The test scores and the industry survey results showed that 59% of the class had a difficult time with the class. The average rating for the UB class was 20% lower than the counterpart ASU class, however, the UB students were able to increase their scores by the same amount as the ASU students. The performance results of the class include (number of students, percentage of class, expectation):

1. The number of students who are attempting to apply the concepts in their organizations: 5 students, 19% of class, expectation 10%
2. The number of faculty who aligned well to the research based format: 3 out of 5 PM section faculty: 60%, expectation 50%
3. The number of research tests: 4 (15%), expectation was 10%
4. The number of students requesting thesis topics on the new technology: 8 (30%), expectation: 10%

5. CONCLUSIONS AND RECOMMENDATIONS

A test has been ongoing to identify whether the UB project management section faculty, the UB MPM program, and the Botswana industry has the capability to transform their education based graduate program to a research based graduate program. Preliminary results show that the potential is there in the faculty, graduate students, and Botswana industry organizations. More testing will identify if the change can be sustainable without the extensive support and effort of the FS and the PBSRG from ASU, which is trying to transfer the research based philosophy into the UB. Further results on research test results, student thesis, publications, and research grants will help in determining the sustainability of the effort.

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INVESTIGATING INTERIOR LIGHT DESIGN, COLOUR RENDERING AND THEIR EFFECTS ON VISUAL IMPAIRMENT A CASE OF LEARNING INSTITUTION

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ABSTRACT

Purpose

The project ultimately aimed at ascertaining whether the interiors of schools are appropriate and aid visual comfort.

Design/methodology

The core target for the study is learning institutions and other supporting groups; eye specialist, local authorities and design consultants. Primary and secondary data collection instruments used was questionnaires, face to face interviews, written literature and internet.

Findings

In Zambia, the school going age is the most vulnerable group to sight complications with cases as high as 62% than any other age group. 87% of the learning institutions were provided with inappropriate interiors which cause and amplifies eye complications.

Research limitations

The research was limited to the respondent's opinions due to time and financial constraints.

Value

A design guide was produced for use by interior designers so that avoidable sight complications can be curtailed.

Keywords: Interior Light, Colour and Visual Impairments

1. INTRODUCTION

Peoples' ability to see is affected by different factors, light and colour being not exempt. Light and colour have a profound effect on the atmosphere of rooms such that if not well combined have the effect of straining the eyes and causing perpetual headaches, tearing, eye pain, etc. a thing more prominent when in class and/or studying.

The increase in sight discomforts is attributed to inappropriate interiors because of an effort made in improving the light and colour fidelity found in people's daily surroundings. An interior that has a lively and stimulating appearance has to be created which can be achieved by variety in the visual scene with contrasts of variety in colour (Hall, 1977, p141).

The paper ultimately aimed at ascertaining whether the interiors of schools are appropriate and aid vision. To attain the needed results the following objectives were devised:

1. To investigate the role of luminance and colour contrast in various visual impairments.
2. To investigate what is minimum and maximum for specification by performance standards of illumination.
3. To establish the relationship between the intensity of lighting and the colour contrasts for an efficient light source to be provided.

2. THE THEORY OF LIGHT, COLOUR AND ITS INADEQUACY; AND THE EFFECTS OF INNAPPROPRIATE APPLICATIONS

Light in a room is composed of the direct component and the indirect component (Hopkinson, 1963, p109). The direct light is a function of the characteristics of the sources, whether natural or artificial.

The indirect component is modified by the reflected characteristics of the room surfaces and partakes of the colour quantities. The source and the modifier are perceived by the eyes.

The first pre-requisite to seeing is the source of *visible radiant* energy such as the sun or one of the many sources of electric light available. The second is a *light modifier*, an object that reflects or transmits light to the eye.

It is called a modifier because it alters the spectral character of the radiation from the source, as well as its intensity and directionality (Murdoch, 2003). This spectral modification is illustrated in **figure 2.1a** and **b**. White light containing all spectral colours impinges on red, green and blue surfaces. Three light waves are reflected to the eye, a red wave from the red surface, and green and blue waves from the green and blue surfaces, respectively.

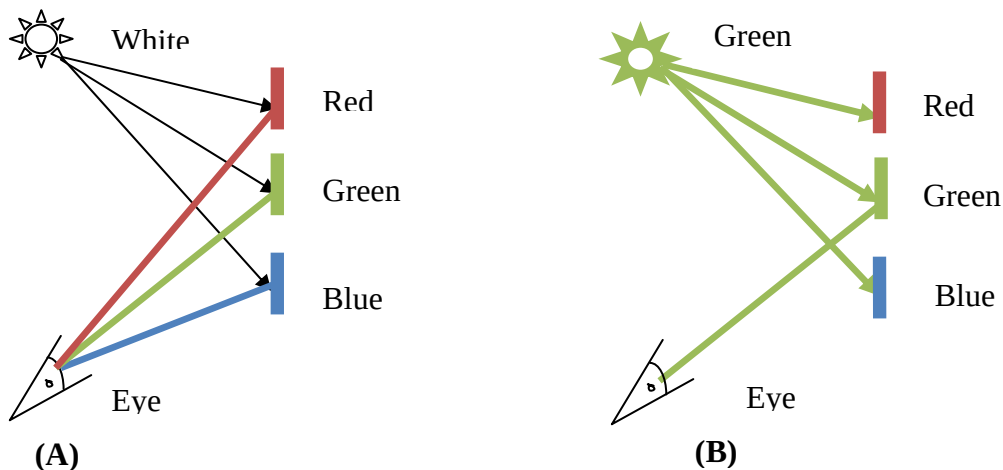


Fig 2.1: Spectral modification of light

Source: Murdoch B.J (2003)

In **figure 2.1b**, the source has only green wavelengths; green light is reflected to the eye from the green surface, which appears green to the viewer. The other two surfaces appear dark, because no light is reflected to the eye from them (Hopkinson, 1963, p109).

These forms of lighting must be well designed for good lighting to be provided and interiors to be sustainable aiding vision. It can be achieved by an intelligent use of colours (Hall, 1977).

The ability to see is affected by different factors namely (Pritchard, 1995, p7): 1] human factors; optical performance of the eye or visual acuity, general condition of the eye, colour perception, 2] environmental factors; movement in the task, glare from the task or surroundings, relative brightness of the task and its surrounding or contrast sensitivity. However, light has a profound effect on the atmosphere of rooms. Hall, (1977), a building and its lighting mechanism must be such that it is possible to read or to carry out delicate normal tasks.

If interior light and colour are inappropriate, visual complications arise such as: disorientation, bleaching of eyes, glare, refractive error, conjunctivitis, disorder of the cornea, eye irritation, etc. The blame of some sight cases is put on discomfort glare (Stevens, 1969, p132). However, some other forms of lighting like the full-spectrum fluorescent lighting have been credited causing dramatic improvements in a wide variety of physical health effects. These include, improved classroom behavior in children and more efficient visual performance (Veitch and McCol (ed) (not dated), p53). The reflective characteristics of the main surfaces, furnishings and content of a room contribute to the illumination and have a marked effect on visual comfort; therefore, it should be considered at an early stage in light design (Hall, 1977, p141).

2.1 Causes of Visual complications from inappropriate interiors

When light is installed, it may please the designer and many others but it fails if it does not please those who have to use it day by day (Stevens, 1969). Considerations to aid vision are established and minimum provisions given.

- 1) Less reflecting wall and ceiling finishes e.g. battleship grey (26%) in a poorly lit room.
- 2) Inappropriate natural light and glazing design, $\frac{1}{10}$ window to floor area ratio. Inappropriate artificial lighting design. Reid (1984), recommends brightness ratio of task: desk: room of 9:3:1.
- 3) None adherence to precautionary measures such as;
 - ✓ Eye injury
A slight abrasion of the cornea often leads to ulceration, severe infection, and ultimately loss of the eye because of non adherence to precautionary measures.
 - ✓ Nutritional deficiencies
The majority of the people with sight complications are caused by high levels of poverty that leads to poor nutrition and subsequently affecting the visual performance.

2.2 Appropriate lighting provisions

In practice, the minimum to maximum illuminance ratio should at least be 0.7. This is achieved if the fittings' spacing across the ceiling is no greater than $1\frac{1}{2}$ times their height above the working plane, or $1\frac{1}{4}$ times if they are louvered and predominantly downward direction.

Methods of glare control depend largely on restricting luminance within the zone of 30° to the vertical while ensuring that the background against which the fittings are seen is light enough (Smith, 2003).

Table 2.1 is provided to act as an aid in the selection of a lighting system. It includes suggested patterns of room brightness. This indicates the anticipated relative brightness of a room with average surface reflectance for a specific type of luminaire.

Table 2.1: Key to pattern of room surface in brightness			
Increasing ceiling brightness ↑	Bright ceiling	Bright ceiling	Bright ceiling
	Dull wall	Medium wall	Bright wall
	Medium ceiling	Medium ceiling	Medium ceiling
	Dull wall	medium wall	Bright wall
	Dull ceiling	Dull ceiling	Dull ceiling
	Dull wall	Medium wall	Bright wall
Increasing wall brightness →			

Source: Pritchard (1995)

3. RESEARCH METHODOLOGY

3.1 Sample design

3.1.1 Target population

The population for the study was from learning institutions in Lusaka and Kitwe. Learning institutions were targeted because of the steady rise in the recommended lighting levels in schools from the 1950s. The recommended standards have shot up to quite extraordinary levels, between 70 and 150 foot candles (*Steadman, 1975*). Further, an average Zambian's life expectancy thus between the ages of 5 and 25 are supposedly spent at school and thus in class (from 08:00 to 16:00).

3.1.2 Sampling frame, procedure, size and justification

a) A sample of learning institutions; pupils and students

Learning institutions were targeted to get the actual information on visual impairments from inappropriate interiors if any, and dimensions that were used comparatively with literature review in determining the adequacy of illumination.

According to Judd et al (1991), the sample to be representative of the population, should at least consist of 3% of the population size. Emory (1980, p150), suggests that the best sample should be 10% of the population. Teshome (2000), according to WHO guidelines a sample size of 2500 persons is said to be sufficient to estimate causes of blindness to a level of public health importance. The figures suggested were not feasible for this study. Therefore, all the elements were considered.

b) Public and private design consultants

Design consultants ensure that minimum requirements are met when designing. An unbiased sample from each stratum by convenience and simple random sample of 10% from the 69 practicing architects was deemed representative because the units were homogeneous.

c) Eye Specialists

They provided information on the complexity of visual impairment and how the eye works and adapts to changes in light. They also helped in distinguishing between eye complications that are caused by natural or artificial causes after critical evaluation of the field results.

d) Local authorities

Judgment and convenience sampling were used to come up with the geographical location of the Local authorities. Building Inspectors provided with information on how they ensure that light and colour design are adhered to as a controlling office in designing and planning, ensuring minimum standards are met. **Table 3.1** summarizes the response rates, sample details and the methods used in sample selection.

Table 3.1: Sample sizes and methods of sample design				
Target	Target		Response rate (%)	Method of sample design
	Population	Sample		
Learning institutions	45	45	62	Judgment, Stratified, Convenient and Random
Design consultants	69	7	43	Convenient and simple random
Eye specialists	-	6	67	Convenient and snowball
Local Authorities	2	2	100	Judgment and convenient
Totals		60	68	

3.2 Methods of data collection

3.2.1 Primary data

The primary data instruments used were questionnaires, administered to respondents. Face-to-face interviews were used to reinforce the data collection exercise.

3.2.2 Secondary data

This data was collected from critically reviewing written sources which included published and unpublished literature that was relevant to the research topic as well as the internet.

4. FINDINGS/RESULTS

4.1 Evaluation of interior lighting

4.1.1 Natural lighting

89% of the respondents had their window openings exceeding the recommended 10% of the floor areas. Therefore, the task in this evaluation was to verify the adequacy of day lighting by assessing the internal environments. To find out whether what was provided as window opening was adequate, the measurements for window openings, floor areas, wall areas and ceiling areas were taken considering the variables as similar per school **see table 4.1**. A relationship between the following variables was to be established:

- ✓ What opening is required by local authorities and design consultants?
- ✓ What has actually been provided?
- ✓ What is adequate by means of calculations?
- ✓ The magnitude of unusual eye complications in or after classes

Table 4.1: Data captured for different class/lecture rooms						
School	Floor area (m ²)	Wall area (m ²)	Ceiling area (m ²)	Total surface area (m ²)	Wall colour	Unusual eye cases
Lusaka						
UNZA	35	72	35	142	Grey	2/6
Evelyn Hone	40	78	40	158	White & C/W	3/5
NRDC	70	102	70	142	Cream white	3/6
NIPA (Burma)	27	95	27	147	Cream white	1/3
Ridge way	20	45	20	85	Cream white	3/5
NIPA (town)	63	96	63	222	Pink	3/5
DK Tech sch.	48	84	48	181	Pink & C/White	3/5
Libala	48	85	48	182	Cream white	2/5
Arakan	52	72	52	176	Light & D/blue	4/5
Kabulonga boys	40	168	40	240	Cream white	1/5
Kabulonga girls	42	130	42	214	White & brown	2/4
Matero Boys	80	288	80	448	Blue & White	3/5
Matero girls	128	158	128	414	Cream white	4/5
Kamwala high	49	112	49	210	White	2/5
Kitwe						
CBU	30	88	30	148	White	3/5
KVTC	89	140	89	318	Blue	3/5

KTC	35	72	35	142	Blue & C/W	4/5
Kitwe boys	64	160	64	288	Blue & white	3/3
Helen Kaunda	57	93	57	207	White & blue	2/5
Mindolo high	56	120	56	232	Blue	4/5
Ndeke high	35	72	35	142	White	1/5
Chamboli high	64	80	64	208	Blue	4/5
Mitanto high	30	74	30	134	Blue & white	4/6
Wusakili high	48	74	48	170	White & Blue	3/5
Malela high	48	70	48	166	Blue	2/5
Lechwe Sch	48	112	48	208	White	2/5

Table 4.2 tabulates the information gathered about what is actually provided, what is recommended by different authorities and what is adequate basing the calculations on the **formula 4.1** of daylight factor:

$$A_w = \frac{DA (1-R^2)}{T\Theta} \quad (4.1)$$

T= diffused light transmittance of glazing including the effect of dirt taken as 0.8

A_w = the net glazed area of the window in m²

Θ = angle subtended by visible sky measured in vertical plane normally to glass from

window reference point taken as 23.5°.

A= the total area of ceiling, floor and wall including window in m²

R= the area weighted average reflectance of interior surface (A) in the initial calculation for rooms with ceiling and mid reflectance wall; taken as 0.5.

D= daylight factor taken as 2%.

Table 4.2: class/lecture rooms adequacy of window openings					
School	Actual window opening (m ²)	What is recommended (10% of floor area) (m ²)	Adequate window opening (m ²)	Adequate or inadequate	Unusual eye cases
UNZA-Beng	6	4	11	inadequate	2/6
Evelyn Hone	7	4	13	inadequate	3/5
NRDC	5	7	11	inadequate	3/6
NIPA (Burma)	5	3	12	inadequate	1/3
Ridge way	6	2	7	inadequate	3/5
NIPA (town)	15	6	18	inadequate	3/5
DK Tech sch.	9	5	14	inadequate	3/5
Libala	15	5	15	adequate	2/5
Arakan	10	5	14	inadequate	4/5
Kabulonga boys	40	4	19	adequate	1/5
Kabulonga girls	10	4	17	inadequate	2/4

Matero Boys	12	8	36	inadequate	3/5
Matero girls	5	13	33	inadequate	4/5
Kamwala high	8	5	17	inadequate	2/5
CBU-SBE	8	3	12	inadequate	3/5
KVTC	6	10	25	inadequate	3/5
KTC	12	4	11	adequate	4/5
Kitwe boys	14	6	23	inadequate	3/3
Helen Kaunda	29	6	17	adequate	2/5
Mindolo high	8	6	19	inadequate	4/5
Ndeke high	16	4	11	adequate	1/5
Chamboli high	16	6	17	inadequate	4/5
Mitanto high	4	3	11	inadequate	4/6
Wusakili high	8	5	14	inadequate	3/5
Malela high	5	5	13	inadequate	2/5
Lechwe Sch	9	5	17	inadequate	2/5

 **Most inadequate-high eye cases**

 **Adequate-**

Reduced eye cases

85% of what is actually provided is less than what is adequate. What the local authorities and the design consultants recommends is 3 times less than what is adequate and less than what is actually provided. This could lead to headaches, presbyopia, refractive error, over straining of the eyes, sand sensations, blurredness, tearing etc.

This proves 75% of the eye specialists' sentiments that the lighting provided in learning institutions is inadequate and that it is a major cause of sight complications among the school going age. **Table 4.2** relates the adequacy of natural lighting with the levels of sight complications. Where the lighting levels are most inadequate, the sight complications are high. Whereas those with adequate lighting levels have reduced eye complications though vary which could be because of other factors such as natural factors.

5.1.2 Artificial lighting

According to design consultants, a class/lecture room should have 1 lighting point per 9m² of the floor area. Further, literature reviews that a class/lecture rooms should have a light intensity of 300lux. Therefore, adequate illumination per room will be based on the calculation of the surface are

$$E \text{ (illuminance)} = \frac{\Phi \text{ (Incident luminous flux)}}{A \text{ (area)}} \quad (4.2)$$

A The surface area upon which the luminous flux lands and this will be based on the

total working surface area of the floor.

Luminous flux and its unit of measure is lumen taken as 2800 for F/T and 1690 for HPB. To find the concentration of lighting for the whole room, the lumen is multiplied by the number of lighting points actually giving light in the column for type in **table 4.3** of actual illumination provided.

Table 4.3: Adequacy in lux of illumination at given heights							
School	Ceiling height (m)	Area of floor (m ²)	Actual illumination provided (Lux)		Adequate illumination (lux)	Difference (lux)	Unusual eye cases
			Type	(E) Lux			
UNZA	>3	35	8 F/T	640	300	+340	2/6
Evelyn Hone	>3	40	3 F/T	210	300	-90	3/5
NRDC	<3	70	3 F/T	120	300	-180	3/6
NIPA Burma	>3	27	4 F/T	415	300	+115	1/3
Ridge way	<3	20	3 F/T	420	300	+120	3/5
NIPA (town)	>3	63	4 F/T	178	300	-122	3/5
DK Tech	>3	48	3 F/T	175	300	-125	3/5
Libala high	>3	49	3 F/T	171	300	-129	2/5
Arakan high	>3	52	0 F/T	0	300	-300	4/5
Kabulonga boys	>3	36	1 F/T	78	300	-222	1/5
Kabulonga girls	>3	42	1 F/T	67	300	-233	2/4
Matero Boys	>3	80	7 F/T	245	300	-55	3/5
Matero girls	>3	128	4 F/T	88	300	-212	4/5
Kamwala	>3	49	4 F/T	229	300	-71	2/5
CBU	>3	30	2 F/T	187	300	-113	3/5
KVTC	>3	89	6 F/T	189	300	-111	3/5
KTC	>3	35	1 F/T	80	300	-220	4/5
Kitwe boys	>3	64	2 F/T	88	300	-212	3/3
Helen Kaunda	<3	57	0HPB	0	300	-300	2/5
Mindolo high	>3	56	2 F/T	100	300	-200	4/5
Ndeke high	<3	35	1 F/T	80	300	-220	1/5
Chamboli	<3	64	2 F/T	88	300	-212	4/5

Mitanto high	<3	30	0 F/T	0	300	-300	4/6
Wusakili	<3	38	2HPB	89	300	-211	3/5
Malela high	<3	48	3HPB	106	300	-194	2/5
Lechwe Sch	>3	48	4 F/T	233	300	-67	2/5



Most inadequate-high levels of caeses



Within adequacy-fewer eye cases

88% of the artificial lighting provided is inadequate and the 12% with adequate lighting is in excess of the illumination recommended. The inadequacy is likely unnoticed because the colours of the walls are able to reflect some of the lighting and the lighting point height to the table top surfaces is within 3m as per recommendations from 67% of the learning environments. This improves the illumination of the rooms and thereafter perceived to be adequate when actually it is inadequate and could lead to sight complications. **Table 4.3** relates the adequacy of artificial lighting with the levels of sight complications. Where the lighting levels are most inadequate, the sight complications are high. Whereas those with adequate lighting levels have fewer eye complications though vary which could be because of other factors such as poor colour renderings, natural factors, etc.

4.2 Evaluation of colour rendering

96% of the learning environments had interior colours on walls and ceilings as per recommendations by the local authorities, design consultants and eye specialists.

This means that the colour rendering of the learning institutions were appropriate. On the contrary, 85% and 88% of natural and artificial lighting is inadequate subsequently not contrasting well with the adequate colour rendering on walls and ceilings. There is little or nothing to reflect by the reflecting characteristics of the room surfaces, as such, lighting provided is inappropriately contrasted. This could lead to eye complications.

4.3 Visual impairments

44% had unusual experiences in or after class from the symptoms they experienced which was attributed to inappropriate light. The light in class/lecture rooms did not contrast well with the colour finishes. This is not only in comparison with the minimum provisions from design consultants

and local authorities but also by the verification of the adequacy using formulae.

Further, 75% of the eye specialists attributed inappropriate interiors to be a major cause of sight complications. Other factors such as age could also lead to sight complications recorded from 33% of the cases above 25 years of age though the school going age records a high prevalence of the eye cases at 62%.

5. CONCLUSIONS

In summing up, the following conclusions have been drawn following the core objectives of the study:

- ✓ Interior light and colour were inappropriate as a consequence hibernating sight complications were rejuvenated, seen from 33% of the 40% cases of complications caused by other factors.
- ✓ The unusual experiences from 58% of the pupils and students are cases of eye complications because of inappropriate interiors. This trend shows and suggests that hibernating eye complications from other causes were rejuvenated by over exposure to inappropriate interiors, **see figure 5.1.**

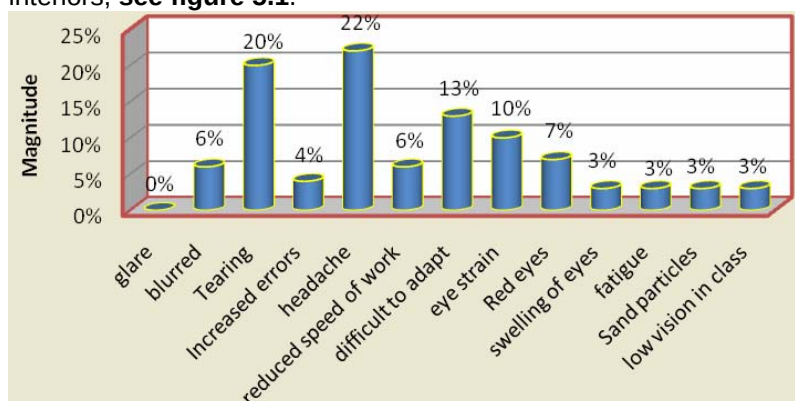


Figure 5.1: Common symptoms in or after class

- ✓ Specifications by performance standards are not adhered to by the design consultants and local authorities because what is actually provided on the ground was less than what is recommended such as

- window openings, 89% of them were more than what is recommended where as 85% were less than what is adequate as shown in **Table 4.2**.
- ✓ 88% of the artificial lighting provided fell short of the adequacy threshold of 300lx of the respondents' learning environments illustrated in **table 4.3**. However, the artificial light points as per initial designs were adequate though deteriorating; they fell short of the minimum requirement of 300lux. In instances where they met the 300lux threshold, it was in excess recorded from 8% of the learning environments.
 - ✓ The trend in magnitude of sight complications increases with the level of education. Thus how come, there is an increase in number of sight complications among the school going age with the figure being as high as 62% to any other age group because the learning environments are predominantly inappropriate.

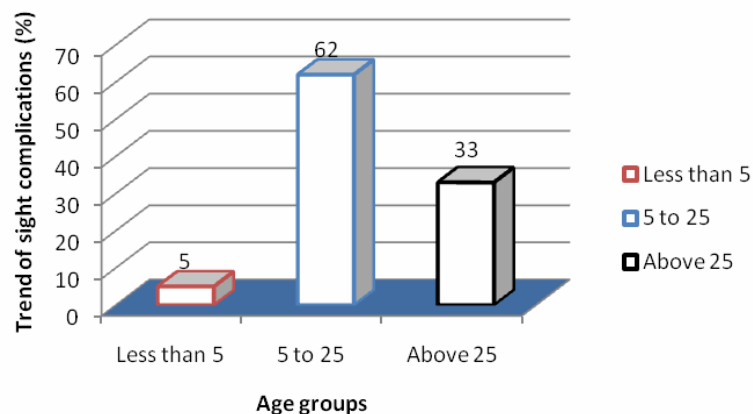


Figure 5.2: Trend of sight complications on different age groups

6. RECOMMENDATIONS

6.1 Prototype Design guide

6.1.1 Natural Light

- ✓ When the orientations of the rooms are along the East/West direction such that in the morning and the afternoon there is direct sun rays, the glasses should be tinted. Whereas, the windows are not tinted, wall

colours with reflecting factors ranging from 20% to 50% should be recommended so that they act as rays absorbers.

- ✓ Designing for daylight factor should be considered using 2% day light factor and/or 20% of the floor area for the window opening. Preferably the use of the daylight factor calculations to get an opening that provides adequate natural light is recommended.

6.1.2 Artificial lighting

- ✓ 1x8ft fluorescent light point per 9m² of floor area should be recommended and adhered to by school authorities and designers, mounted at 2.5 to 3m floor ceiling height. This will provide adequate illumination of 311lux.
- ✓ Light fittings should be shielded so that the intensity of the lighting should be reduced.
- ✓ Light should be placed close to the task. This is true with overhead lights. In classrooms/lecture rooms and drawing rooms, the down light over the working top should be in front of a person and not over the shoulder.
- ✓ Uniform illumination should be maintained where possible. Oftentimes the way recessed lighting is located creates scallops of light on the walls or floors. These patterns, or pools, of light can be confusing and disorienting.

6.1.3 Colour rendering

- ✓ Precautionary statements should be put on paint tins stating the characteristics of paints and recommended ones for learning institutions.
- ✓ The use of glossy surfaces should be avoided, on floors, ceilings and worktops; they become mirrors, reflecting the brightness of the light source and increasing the impression of glare.
- ✓ The use of dark ceilings such as those with reflecting factors not exceeding 40% is not recommended against bright luminaires. The walls should be painted with paints of reflecting factors above 40%.

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CONGESTION CHARGING AS A TRAFFIC REDUCTION STRATEGY: THE CASE FOR CAPE TOWN

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ABSTRACT

Purpose of this paper

This paper examines the feasibility of a congestion charge in Cape Town's Central Business District (CBD) with particular reference to congestion charge and technology options, potential charge area as well as potential traffic reduction.

Design/methodology/approach

The research methodology included a combination of case studies, analysis of secondary data, and application of transportation elasticities for congestion charging. In particular, the case studies were drawn from the experiences of Singapore and London. The secondary data were obtained from the City of Cape Town.

Findings

The paper concludes that congestion charging in Cape Town is feasible from a traffic reduction perspective, and that a cordon based charge with manual payments and an ANPR enforcement system are the best fit.

Research limitations/implications

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The research does not address the political and socio-economical aspects of congestion charging. These are two areas for future research, which are crucial for the successful introduction of a congestion charge in any South African context.

What is original/value of paper.

Given that very little, if any, South African research into the traffic impact of congestion charging exists, this paper aims to initiate debate around the challenges and practical implications of traffic reduction strategies in South African cities.

Keywords: Congestion charging, Cape Town, travel demand management

1. INTRODUCTION

Travel Demand Management (TDM) is increasingly being introduced worldwide as vehicle volumes increase. However, these efforts have met with varying success as the ability decreases of providing additional capacity through road space. Where applied TDM measures have sought to manage congestion by optimising current and proposed infrastructure. Cape Town in South Africa is no different. As a major developing city, limited by its geographical layout and ability to build new transport infrastructure, the city officials (hereafter referred to as the City) have for some time been considering the introduction of TDM strategies and measures (City of Cape Town, 2006). This consideration has targeted the improvement of the flow of traffic in and around the city precinct.

This paper explores the potential impact of the introduction of a congestion charge to downtown Cape Town on traffic volumes. It also explores the type of congestion charge and technology which could be used should the decision be made to progress as well as the potential traffic reduction which could be achieved. Although the paper does not address social and economic issues directly it does recognise the importance that these factors play in the successful introduction of a congestion charge in the South African context.

1.1 TRAFFIC GROWTH IN CAPE TOWN

Cape Town is one of the major South African cities. Its geographical layout is unique as access to the CBD is more restrictive than other major cities in South Africa such as, for example, Johannesburg and Bloemfontein in the north-east of the country. This challenge along with an increasing population and rising economic development adds pressure to the already well utilised road system.

The City has, since the 1990s, been developing various goals and visions for improving the road transport system and making it more

sustainable. It has predicted that traffic volumes in the city would increase at two and half percent (2,5%) per year. Figures 1 and 2 below illustrate the 2006 and 2011 passenger volumes in Cape Town based on the City's EMME/2 strategic transport model (City of Cape Town, 2008).

The predictions are based on existing transport infrastructure at the time the model was developed, as well as the implementation of developments known at the time, and proposed transport infrastructure projects.

The Moving Ahead (MA) strategy document (City of Cape Town, 1998) reported an average home to work journey of approximately 17km. This distance was predicted to decrease by 20% as a result of the City's Metropolitan Spatial Development Framework (MSDF). The MA also reported that the modal split within Cape Town was 49:44:7, namely public:private:walk/other. The 2006 calculated modal split was reported to be 48:39:13, which was below the target of the Department of Transport of 54:34:12. This split suggests a forecast positive shift that will impact the capacity of the existing road network. It is noteworthy that, when determining modal choice factors as part of the MA, factors such as income level, land use patterns, quality of public transport and lifestyle factors had more of an influence on mode choice than congestion, parking and cost of travel.

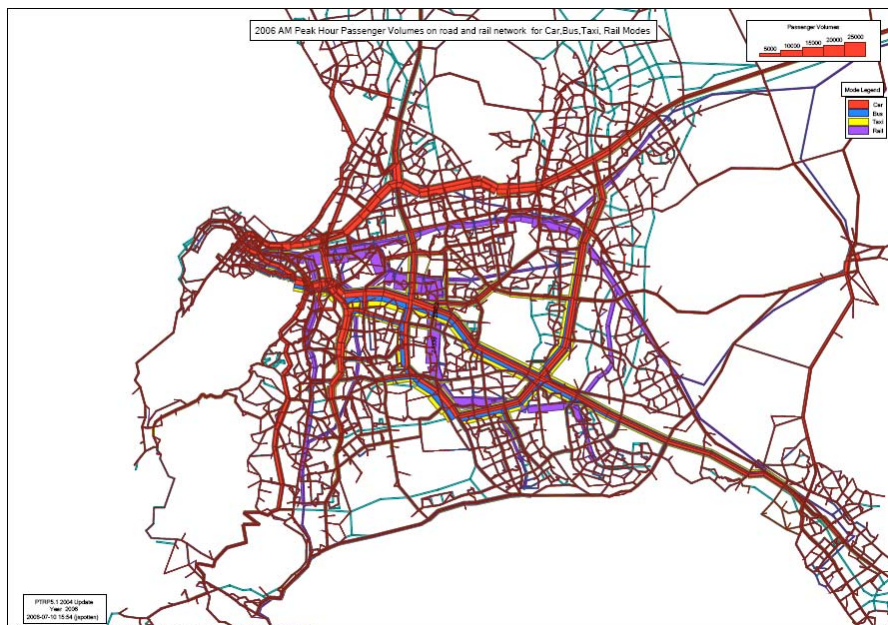


Figure 1 2006 passenger volumes within the Cape Town during the morning peak period¹

¹ Maps courtesy of the City of Cape Town's EMME/2 model

In an attempt to mitigate against the impact of increased traffic volumes on the road network, the City developed and published a draft TDM strategy for comment in August 2006 (City of Cape Town, 2006). This strategy recognised that the existing road network around the CBD did not have the capacity to accommodate increasing demand and congestion levels. The TDM strategy proposed the introduction of High Occupancy Vehicle (HOV) lanes as well as park-and-ride facilities as measures that could be introduced in the short term. It also proposed the introduction of a congestion charge in the medium term. The draft strategy recognised that there were challenges that would first need to be addressed before it could be introduced. These challenges included payments collection technology, the location of payment zones and opposition from user groups.

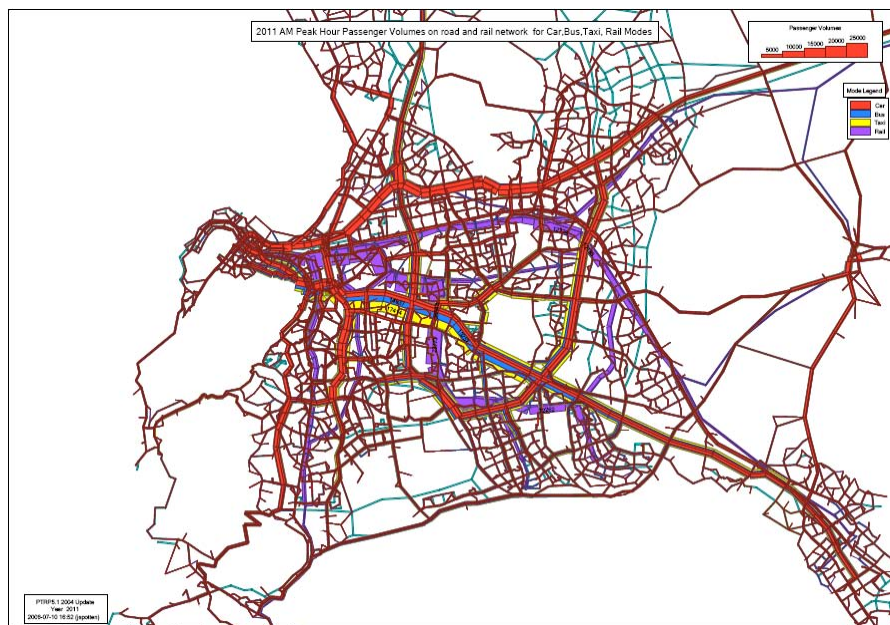


Figure 2 2011 passenger volumes within Cape Town during the morning peak period

1.2 WHAT IS CONGESTION CHARGING

Congestion charging is a form of road user pricing, whereby motorists are charged for the delay they cause to other motorists. According to Mattsson (2003), the primary objective of congestion charging is to reduce congestion, with secondary objectives of reducing the environmental impact of vehicle travel and raising funds for transport infrastructure improvements. The concept of congestion charging goes as far back as 1964, where the United Kingdom Department for Transport commissioned a study into the technical feasibility of a road pricing system which would

be able to reduce congestion through economic justification. This report is commonly known as the Smeed Report (United Kingdom, 1964). However, it did not address the social or political factors, which need to be overcome for the successful implementation of the recommendations of the report.

The authors of the Smeed Report also maintained that congestion charging alone would not solve congestion problems and that road infrastructure would still be required.

The Smeed Report identified operational requirements, which were later expanded upon by other researchers such as May (1992), Vickrey (1992) and Foo (2000) to include driver and social behaviour as well as principles for an efficient system. The requirements included, *inter alia*,

- The charge rate should be equal, or close to, the cost to the motorists as well as the cost to other motorists;
- As an optimum, the charge should be based on the time and distance travelled;
- The public should perceive the charge system as fair and that it can be trusted;
- It should be user friendly to all motorists, including infrequent travellers, including the payment system;
- The privacy of users should be protected, while still allowing users access to their accounts;
- Some vehicles should be exempt from the charge and includes emergency services and public transport;
- There should be a mechanism in place whereby taxi drivers can pass the cost of the charge to passengers;
- During charge periods, on-street parking should be restricted; and
- There should be a special rate for delivery vehicles, which would be reflective of their effect on congestion.

There are different types of congestion charging which vary in complexity such as, for example,

- Parking charges: Although not an obvious one, it is thought to be the simplest. It is the increased cost of parking in the area, along with the time it takes to find a parking space, which is considered to be the deterrent. It is not effective as it does not have an impact on through traffic and local authorities do not have a mechanism in place which would influence the price charged by privately owned garages.
- Point charge: Is similar to a toll charge, whereby motorists are charged when they pass a charge point within a congested area. The charge rate can vary depending on the time of day.
- Cordon charge: Is a boundary around a congested area and motorists are charged as all entrances and exits. The rate can vary, from charging for every entry to charging daily.
- Zone charging: Is similar to a cordon charge, but motorists are also charged for driving within the zone with charge rates varying. Where there is more than one zone, motorists are charged for travelling from one zone to another.

- Distance based charging: This charge is what the name suggests. Motorists are charged for the distance travelled. It is more sophisticated than the other above named charges.
- Time based charging: As the name implies, this charge is based on the time motorists spend travelling. Although more reflective of travel conditions, it does, however, create an environment whereby motorists could increase travel speeds to decrease the time spent travelling, creating what could be considered unsafe traffic conditions.
- Time and distance based charging: This is the type of charge, which the Smeed Report recommends as the optimum. It reflects the distance travelled as well as the time spent travelling. The charge rate could vary depending on the time of day and traffic conditions (Gomez-Ibanez and Small, 1994; Institute of Highways and Transportation, 1997).

The type of charge, which could be introduced, is closely linked to the type of technology available and considerations about whether it will form part of the charging system, the enforcement system or both. Available technologies typically consist of the following components, namely

- On-vehicle equipment (not applicable to all technologies);
- Roadside equipment; and
- Central computer.

1.3 CONGESTION CHARGING TECHNOLOGIES

There are a number of technologies in use, many of which are still at the research stage of their development.

1.3.1 Automatic Number Plate Recognition

The Automatic Number Plate Recognition (ANPR) system is primarily an enforcement system. Fixed and mobile cameras are used to capture images of a vehicles front and/or rear licence plates. The images are then sent through to a central computer, which then matches the licence number plate against those which have been registered. If a vehicle is captured, but has not paid the charge, the violation penalty process then commences.

Transports for London (TfL) have undertaken technology trials to assess improvements made to this technology in recent years (London Congestion Charging Technology Trials, Stage 1 Report, Jan. 2005).

They found that ANPR could process input from two cameras, front and rear, without compromising the accuracy of the system. The system could also make use of roadside processing without compromising performance. This system makes use of cameras, which could be mounted on poles or street furniture. The number of cameras was

dependent on the number of lanes. The TfL trials reported a detection rate in excess of 90% for a single vehicle pass. A study undertaken by several European cities found that by utilising front and rear cameras, the detection rate further decreased (Transport Initiatives Group, Pricing Road use for Greater Responsibility, Efficiency and Sustainability in cities (PRoGRESS), July 2004).

ANPR is considered to be less visually intrusive than the tag and beacon system. To complement the ANPR system, a manual payment system could be utilised. Such a system would entail motorists paying the charge at a number of dedicated outlets, telephonically and online. Licence plate numbers are then registered on the ANPR for enforcement purposes. Data are not saved unless there is a violation. This system also has the flexibility of making use of mobile units for spot checks within the charging area.

1.3.2 Tag and Beacon

The tag and beacon system could potentially be both a charging system as well as a component of the enforcement system. This system uses Dedicated Short Range Communication (DSRC), which utilises microwave technology. Vehicles are fitted with a tag, which could be a read only, read-write or smart card, which is read when the vehicle passes a charging point by a roadside beacon. The tags could contain information regarding prepaid amounts of money, billing information or registration information. For enforcement, the tag and beacon system is supplemented by ANPR. This charging system could be expensive to introduce, depending on the type and quality of tag as well as high capital cost of installing tags in vehicles. It does offer the flexibility of variable charging, although it is better suited for cordon charging (PRoGRESS, 2004).

The TfL technology trials found that the tag and beacon system had a 99.55% detection rate. The Singaporean Electronic Road Pricing (ERP) agency reported a 0.07% error rate three months after implementation (Foo, 2000). It also highlighted a number of challenges that would need to be addressed. These challenges include, inter alia, interoperability between systems provided by various suppliers, battery drain and front and rear spatial matching, and the effectiveness of tag and beacon communication as a result of metallised windscreens. The tag and beacon system could also be visually intrusive, depending on the type of congestion charge and the location of beacons. Use on multi-lane roads would require cantilevers on which the beacons and ANPR cameras could be mounted.

1.3.3 Global Positioning Systems

Another technology, currently being researched, is the use of Global Positioning Systems (GPS). This technology allows for a sophisticated

type of congestion charge to be introduced. However, at this stage, the technology still needs to mature. There are a number of challenges which would need to be resolved first before it can be introduced in practice (Distance Based Charging Report on Transport for London's GPS OBU Trial, Oct. 2006). The following were some of the challenges that have been identified:

- The accuracy of locating vehicles as reception of the signal, by the satellite is affected by tall buildings, tunnels and garages;
- Systems within the vehicle itself can affect the operation of the system, and is usually as a result of where the on-vehicle unit is located; and
- The current technology can only record journey functions currently and any additional functionality required would increase the cost of the system.

1.3.4 Digital Mobile Phone Technology

Another emerging technology is the Digital Mobile Phone Technology (DMPT) system. It is similar in operation to the GPS system, except that it makes use of cellular phones and network base stations (TfL, 2005). It does have privacy concerns, which need to be addressed, as well as location inaccuracies. The location inaccuracies are as a result of the way the cellular network operates given that signals switch between network base stations. These signal switches depend on location and cellular network traffic at the time.

Table 1 provides a summary of which technology is suitable for the various congestion charging types.

Table 1 Congestion Charge/Technology Matrix

Congestion Charge Type	ANPR	Tag & Beacon	GPS	DMPT
Point charging	✓	✓	✓	✓
Cordon Charging	✓	✓	✓	✓
Zone Charging	✓	✓	✓	✓
Distance Based Charging			✓	✓
Time Based Charging			✓	✓
Distance and Time Based Charging			✓	✓

1.4 INTERNATIONAL EXPERIENCE

There are a number of developed cities, which have introduced congestion charging such as, for example, London in the United Kingdom where it has been the most publicized and most notably also Singapore, because it was the first to introduce forms of congestion charging.

1.4.1 London

The United Kingdom Department for Transport and TfL conducted research into the feasibility of a congestion charge for London since 1995 (HMSO, 1995). When the decision was made to introduce the charge, it was subject to it being implemented within a short period of time. This meant that the option chosen needed to be in place within a short period of time. To this end, TfL introduced a cordon congestion charge in London in February 2003 at a daily flat rate of £5 per day (R70), which increased to £8 in 2005. It was a manual payment system which was enforced using ANPR. Payment was made through approved news agents, online, telephonically and text messaging. The original cordon area is illustrated in Figure 3 below. While residents within the zone were given a 90% discount, the following road user groups were exempt from the charge, namely

- Disabled car uses;
- Buses;
- Licensed taxis; and
- Motorcyclists.

The charge had to be paid within a 24-hour period after entering the zone, and if not, the charge rate then increased to £10.

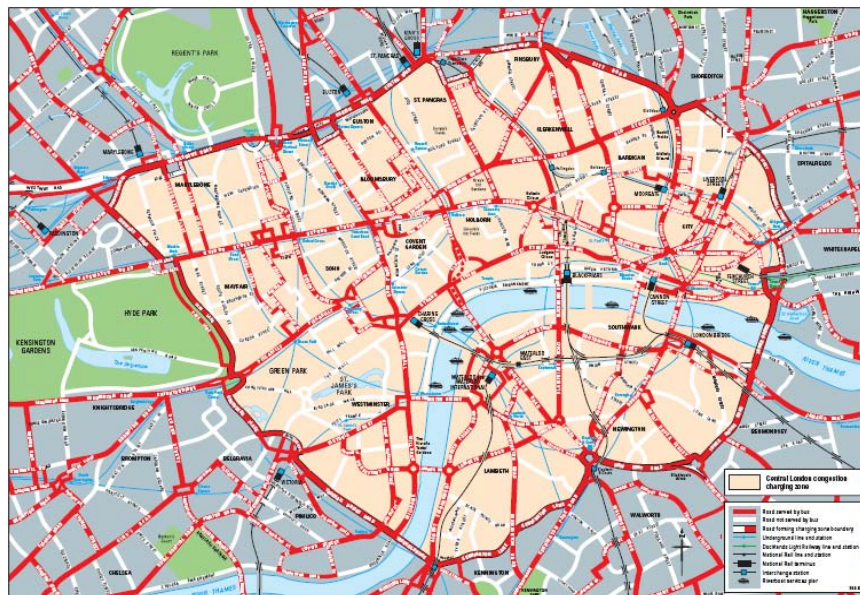


Figure 3 Central London's Congestion Charge Area²

Within the first year of its introduction, TfL reported a 30% reduction in congestion as well as a journey time saving of 14% in cross London journeys (Transport for London Impacts Monitoring – First Annual Report, 2005). In September 2005, the then mayor of London, Ken Livingstone announced the expansion of the cordon area to the west of the current one. The extension of the area was introduced in February 2007 and three months thereafter, TfL reported an approximate reduction of between 10% and 15% in traffic volumes (Central London Congestion Charging Impacts Monitoring Fifth Annual Report, 2007). Even with this success, the now mayor of London, Boris Johnson, has undertaken a public consultation to remove the western extension.

The London congestion charge illustrated that a relatively simple congestion charge could be introduced.

1.4.2 Singapore

Singapore introduced a paper-based Area Licensing Scheme (ALS) in 1975 as a result of the rapid economic growth which the city experienced in the 1970s (Gomez-Ibanez and Small, 1994). The ALS covered an area of 6.1km² and was enforced manually by enforcement officers at 22 entry points. It was first introduced during the morning (AM) peak period between 07h30 and 09h30 from Monday through Saturday.

The following exemptions applied when the charge was first introduced and included:

- Carpools or taxis carrying more than three people;
- Public transit vehicles; and
- Trucks and motorcycles.

It was initially forecast that there would be a traffic reduction of between 25% and 30%. However, a 44% reduction was achieved (Phang and Toh, 2004). The ALS resulted in the following changes in traffic travel patterns, namely

- An increase in traffic volumes before and after the AM peak period;
- Traffic diverted onto alternative routes to avoid the charge area; and
- Although there was a decrease in traffic volumes entering the cordon area during the AM peak, there was no change in the outgoing traffic volumes in the evening (PM) peak period.

Because of the change in these travel pattern changes, the following adjustments were made between 1975 and 1989, namely

- Increasing the tail end of the AM peak charging period from 09h30 to 10h15;
- The charge rate increased from S\$3 to S\$5, later reduced back to S\$3;

² Source:

http://www.tfl.gov.uk/assets/downloads/cc_proposed_boundary_map.pdf

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- Introducing a PM peak charging period from 16h30 to 19h30, later reduced to 18h30; and
- All initial exemptions were removed, except for buses and emergency service vehicles (Gomez-Ibanez and Small, 1994).

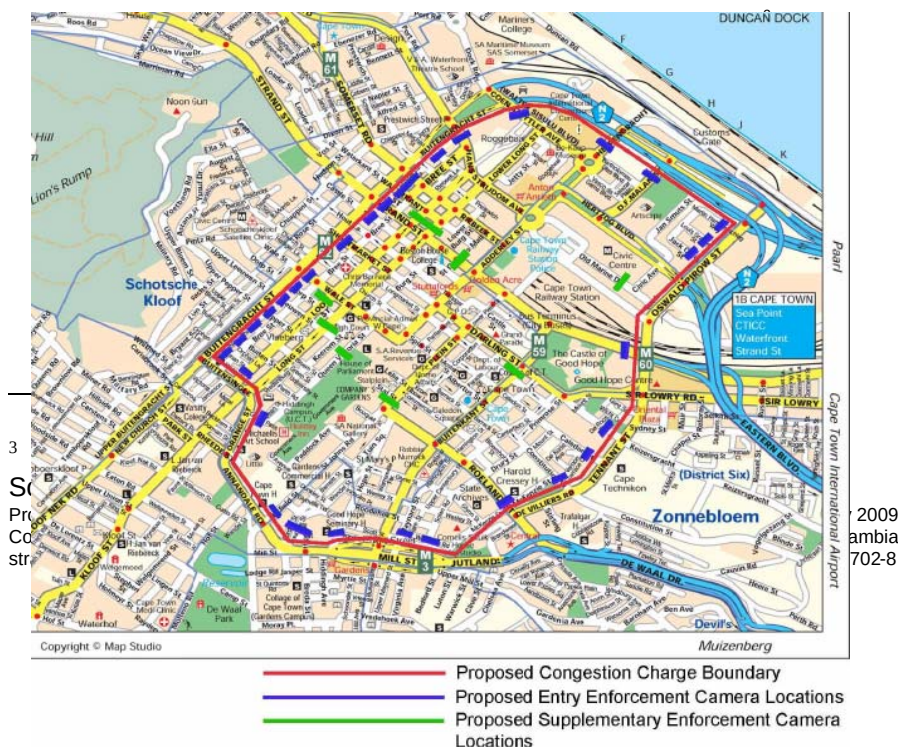
In subsequent years, the ALS created peaks and troughs in daily traffic patterns and in 1994 a whole day charge was introduced (Phang and Toh, 2004). The new charge times included a few hours on a Saturday from 07h30 to 15h00.

1.5 A CHARGE FOR CAPE TOWN

The type of congestion charge most suitable for Cape Town, at this stage, would be a simple cordon based charge. This suggestion is based on the relative ease with which it could be introduced while making use of the existing ANPR enforcement system. The system would need to be adapted to accommodate charging. It would also give the City the flexibility to introduce a more sophisticated charging system at a later stage. It would be easier for visitors to understand than other more complex charging types. It is envisaged that there would need to be a number of exemptions for certain types of vehicles, especially those that offer an alternative mode of transport to the motor car. These exemptions would include

- Buses;
- Minibus taxis in terms of the recapitalization program;
- Metered taxis; and
- Emergency vehicles.

When determining a charge area for the Cape Town CBD, one of the primary factors would be the availability of a bypass route around the cordon, providing through-traffic with an alternative option. The cordon area is illustrated in Figure 4.



In terms of a technology that would be most applicable to Cape Town, the tag and beacon, GPS and DMPT systems have been discounted. The latter two because the technology still has what can be described as fundamental challenges that first need to be resolved.

The tag and beacon system was discounted due to the capital cost implication. It would require the installation of on-vehicle units (OVUs), which could be costly if they were subsidised by the City. The road side equipment could be visually intrusive as it would, not only require an ANPR system, but beacons to read the tags as well. A further complication was the accommodation of visitors to the city. Finally, the issue of vandalism also needed to be considered. As a result of the above factors, it was not considered as a first step installation.

Currently, a system similar to London's manual payment system would be most feasible as the payment system could be through local approved retailers, post offices, telephone and online, similar to the way electricity vouchers and airtime for cell phones can be purchased in South Africa. Visitors could be advised about the payment system and how the charge worked through the media and they would not require any OVU.

The enforcement of the congestion charge would be by means of the existing ANPR system. The City currently uses it to enforce the bus and minibus taxi (BMT) lanes on the N2. A traffic regulation was already in place and the City would be looking to extend it to include other bus lanes across the city. The system could be adjusted to include a congestion charge area. In terms of infrastructure, it would require primary cameras to be installed at the entry and exit intersections of the cordon area and supplementary cameras at strategic locations within the area. Figure 4 also illustrates potential camera locations.

Figure 5 Potential camera location as the Herzog Boulevard/Oswald Pirow intersection



In terms of the visual impact of cameras on the landscape of the city, this impact can be mitigated by utilising existing road infrastructure and available road space without cluttering that area and causing driver confusion with too much information. Figure 5 illustrates the potential mounting of cameras and signage.

1.6 Impact on Traffic Reduction

In determining the potential percentage traffic volume reduction, transportation demand elasticities were used based on post-implementation studies where charging had been introduced. To this end, an elasticity range of -0.1 to -0.5 was applied. A weighted average trip cost was calculated to be R85.50. This trip cost included the cost of vehicle operating costs as well as parking. It did, however, not include the cost impact on passengers' time.

The formula used in calculating traffic reduction was as follows (Equation 1.1):

Please ensure that equations are numbered correctly, without repetition, and that no important equations are omitted from the numbering scheme. See Equation (1.1) as an example of correct layout and numbering.

$$\eta = \frac{[Q2 - Q1](P1 + P2)}{[(P1 - P2)(Q1 + Q2)]} \quad (1.1)$$

Where, η = demand elasticity

Q1 = Traffic volumes before

Q2 = Traffic volumes after

P1 = Travel cost before

P2 = Travel cost after

Table 2 summarises the potential traffic reduction for various charging rates.

Table 2 Percentage Traffic Reduction

Elasticity	R15	R20	R25	R30	R50	R90
-0.5	7.74%	9.94%	11.98%	13.88%	20.31%	29.39%
-0.45	7.00%	8.99%	10.85%	12.58%	18.47%	26.85%
-0.4	6.24%	8.03%	9.70%	11.26%	16.58%	24.23%
-0.35	5.48%	7.06%	8.54%	9.92%	14.66%	21.52%
-0.3	4.72%	6.09%	7.36%	8.56%	12.70%	18.74%
-0.25	3.95%	5.10%	6.17%	7.19%	10.70%	15.86%
-0.2	3.17%	4.10%	4.97%	5.79%	8.65%	12.89%
-0.15	2.39%	3.09%	3.75%	4.38%	6.56%	9.83%
-.01	1.60%	2.07%	2.52%	2.94%	4.42%	6.66%
Average Reduction	4.70%	6.05%	7.32%	8.50%	12.56%	18.44%

From Table 2, it is evident that the potential average traffic reduction could be between 4% and 18%. The highest reduction in traffic would be from low to middle income drivers, which had an elasticity of -0.3 to -0.5.

Although the results indicate that there would likely be a reduction in traffic volumes, this reduction strategy would have a socio-economic impact, as it would affect low and middle income drivers more than high income drivers. The former make up 59% of drivers entering the CBD. The charge would also need to be double the current travel costs in order for it to be most feasible.

2. CONCLUSIONS

The study reported in this paper found that a reduction in traffic volumes could be achieved through the introduction of a congestion charge. It also highlighted that there were a number of challenges that would first need to be addressed before it could be considered. These challenges include an improved public transport system which the City was already working on as well as an analysis of the socio-economic impact that the charge would have and how best to mitigate against that impact. The anecdotal evidence from the experience with the effort to revamp the existing taxi industry suggests that overcoming resistance from this sector might be problematic.

Although congestion charging was only investigated in terms of traffic reductions, the authors recognise that there are challenges. Further, even though the introduction of congestion charging is envisaged as a medium term TDM measure, implementation could take some time and further

research. This paper serves to stimulate debate around congestion charging for cities such as Cape Town that face similar challenges and constraints.

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FUNDAMENTAL PROPERTY VALUATION AND THE CONSTRUCTION INDUSTRY

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ABSTRACT

Purpose

The residential property market in SA has seen a lot of turbulence lately. Growth was perceived by some as a "Property Bubble" and by others as a healthy investment opportunity. This paper considers the fundamental drive behind property demand, with specific reference to the residential sector. It analyses the recent property cycle with comparison to the past, and considers the effects on the construction industry.

Design

The study uses methods of statistical fit of historical macro-economic variables, with the variables in the two markets under discussion. This is performed by combining existing principles with new views on the combination of variables in order to establish patterns that fit actual circumstances in the local markets.

Findings

The research found that gross domestic product, as main indicator of growth within the country, is the main driver of disposable income for households, and subsequently the driver behind property values. The latter could be compared to construction cost, which would trigger new construction if property values are higher than construction cost.

Value

The paper provides a prediction for expectations on the property and construction industries, and proposes a method to monitor the activities more closely, in order to form strategies on how to deal with it.

Key words: Property demand, property values, macro-economic property variables, construction demand.

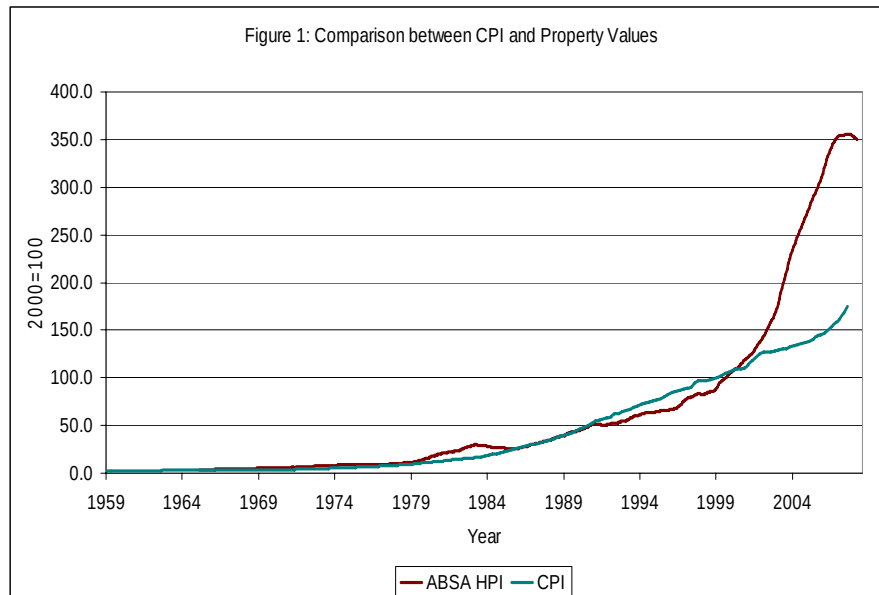
1. INTRODUCTION

The property market in South Africa has seen a lot of turbulence lately. There were excessive growth and demand for residential property since the early 2000's, now followed by a sudden situation of perceived no demand on the property as well as construction sectors. This paper attempts to analyse the property behaviour in the light of the residential values, but also as trigger for new construction.

1.1 Demand for property

When considering macro-economic behaviour, two main indicators are the gross domestic product (GDP) and the consumer price inflation (CPI). In the long term it would be thought that property values should follow CPI, as housing expenses forms part of the basket of items that dictates CPI.

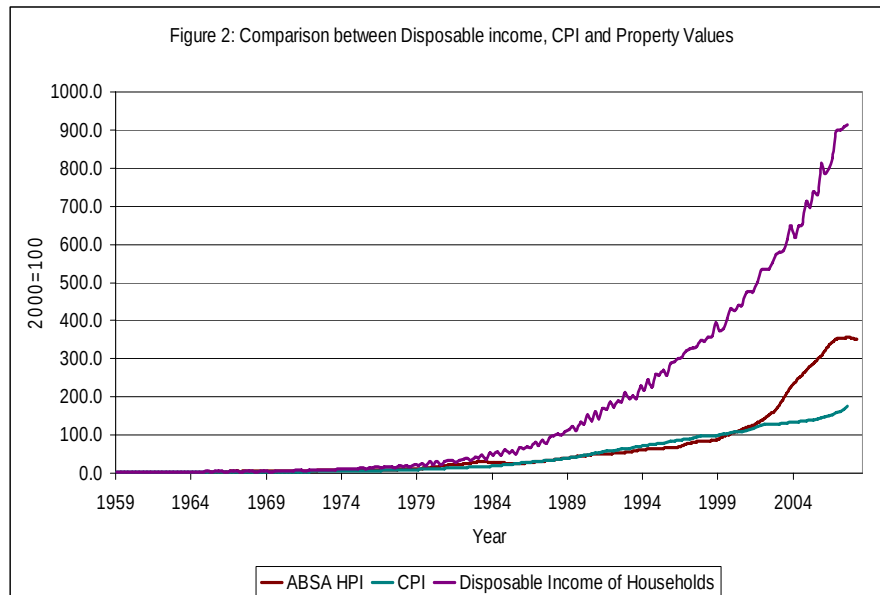
Figure 1 shows the comparison between CPI and property values, both on a 2000=100 scale index.



Source: ABSA House Price Index
SA Reserve Bank

Although it seems in figure 1 that there was a fairly close correlation for many years, there are a number of periods where the two indexes differed substantially, with the current situation being the largest discrepancy in the data period under review. This poses difficulties in predicting if the trend of property values reverting back to CPI will continue, as this would indicate that the property market is 45% overvalued. If true, there might be some serious consequences for the economical situation in South Africa.

The next question that needs to be raised is one of affordability. Figure 2 shows the disposable income of households since 1960, and compares that to the two indexes shown above. The disposable income is shown on an index that starts at the same level as CPI in 1960, and shows the difference in growth to CPI.

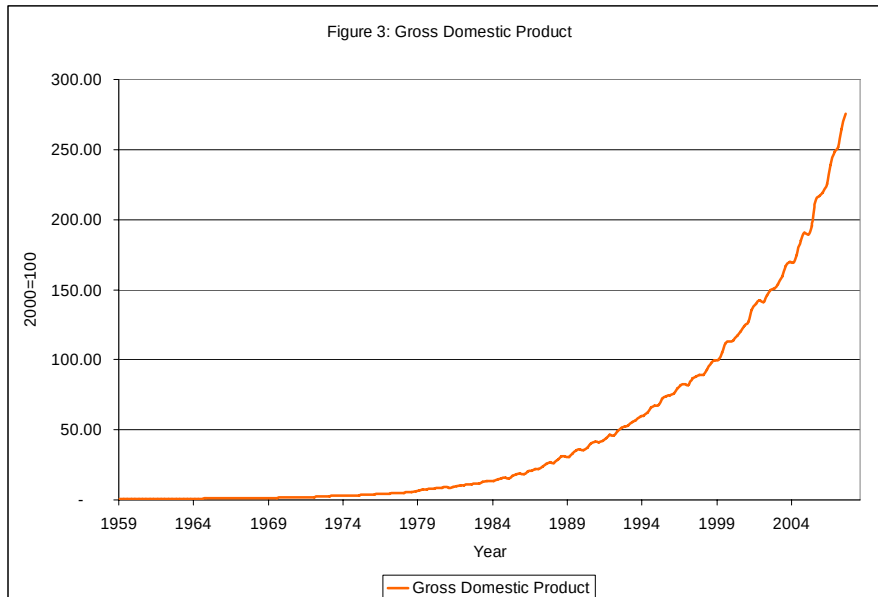


Source: SA Reserve Bank

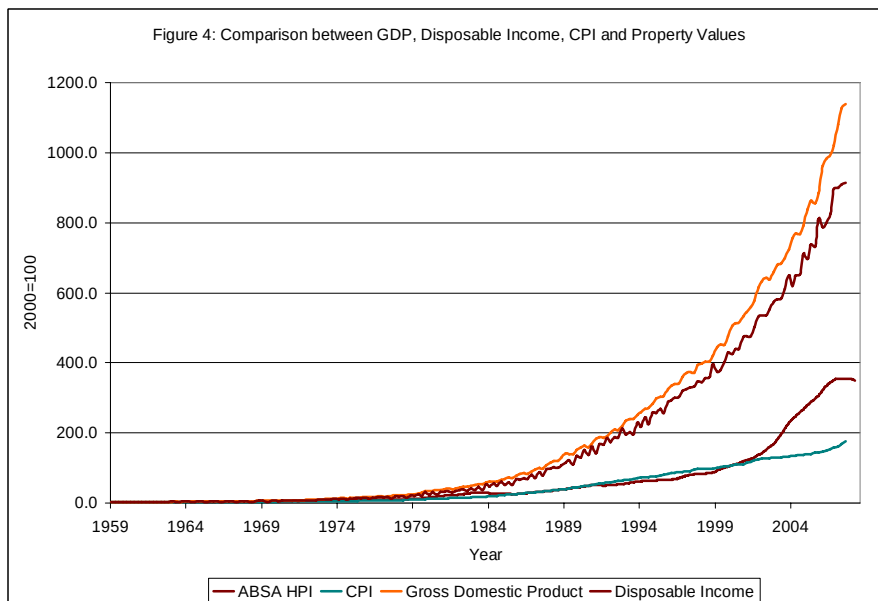
Disposable income has increased substantially faster than CPI, and if this is considered, it seems as if higher house prices are affordable, motivating the increase in prices above the level of CPI. It however still does not explain the actual level of property values, or the perceived correlation to CPI prior to the 2000's.

The other main indicator of growth in the economy is gross domestic product (GDP). This shows the level of goods produced in the country. The GDP for SA is shown in Figure 3 as a 2000=100 index.

On its own it doesn't provide much information, but when compared to the previous indexes, a clearer picture emerges. Figure 4 shows this with the GDP index adjusted to start at the same level as CPI and Disposable income in 1960.



Source: SA Reserve Bank



Source: SA Reserve Bank

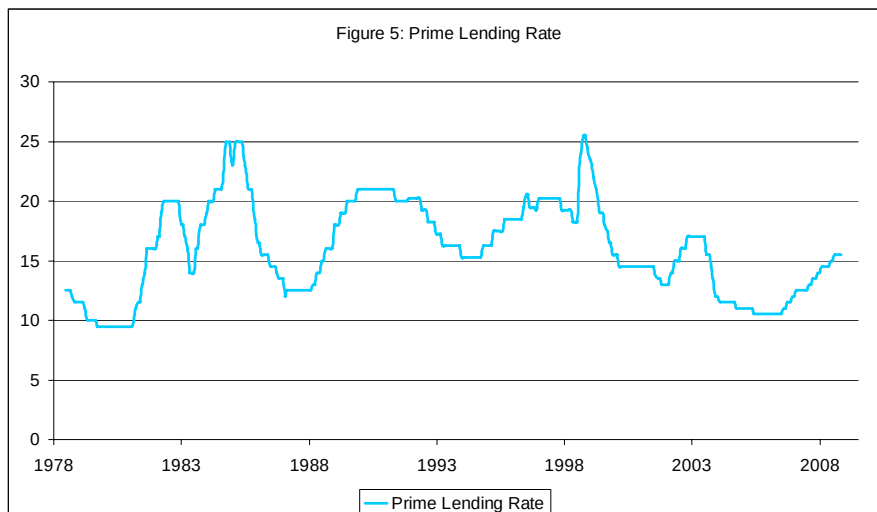
Disposable income follows GDP directly, although the growth is slightly slower than GDP. It can however be taken that GDP would dictate

disposable income, but in order to predict the level of disposable income, the factor needs to be applied in the growth thereof.

It also follows that property values are not directly related to GDP growth, and could therefore not be predicted by it. The above however does indicate that disposable income follows GDP growth, and therefore if it is accepted that disposable income is required to pay for property services, a correlation might be found between property values and GDP growth.

Another factor that influences the macro-economy is interest rates. If accepted that the main form of capital utilised in the purchase of real estate, and specific houses, is of borrowed capital, it is expected that interest rate levels would have a significant influence on property demand, and ultimately its value.

Interest payment as one of the main expenses for households, being for house finance, vehicle finance, credit cards, overdrafts, etc. should be considered for affordability of goods and services, and more specifically housing. Figure 5 shows the prime overdraft lending rate for banks from 1978.



Source: SA Reserve Bank

The prime lending rate of banks is the rate at which banks lend to clients. The rate could vary depending on the specific client's profile, or security provided as collateral. If this rate is taken as average cost of lending, the total affordable value, is the amount of interest that can be serviced from disposable income, multiplied by a utilisation factor. The following function explains this:

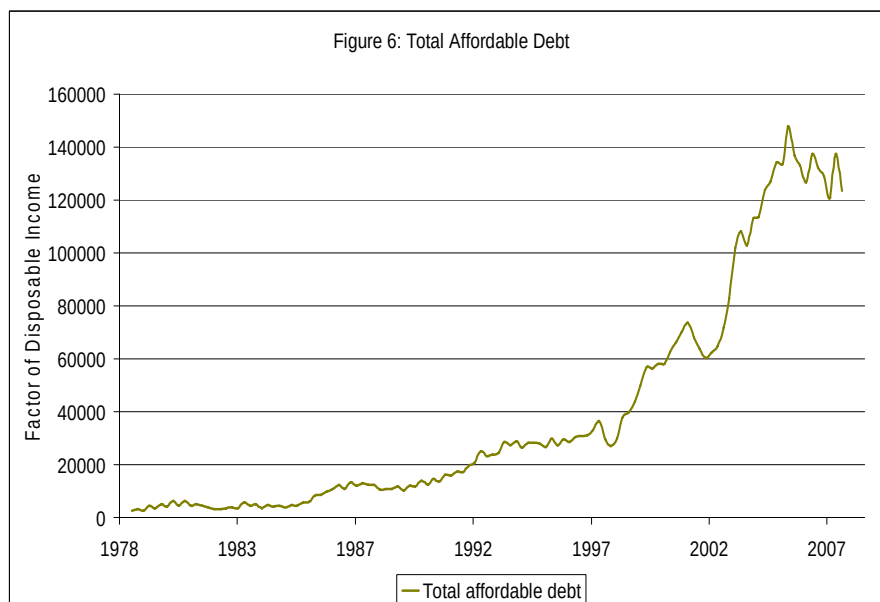
$$\text{Interest payment} = \text{Loan Amount} \times \text{Interest Rate} \dots\dots 1$$

This holds that for a given loan amount, an increase in the interest rate would result in an increase in the interest payment per period. If the function is re-written, the following could apply:

$$\text{Loan Amount} = \frac{\text{Interest payment}}{\text{Interest Rate}} \dots\dots\dots 2$$

This indicates that should the available amount for interest payment be divided by the going interest rate, it is possible to calculate the total amount that could be borrowed of which the interest could be serviced from the available amount set aside for interest payment.

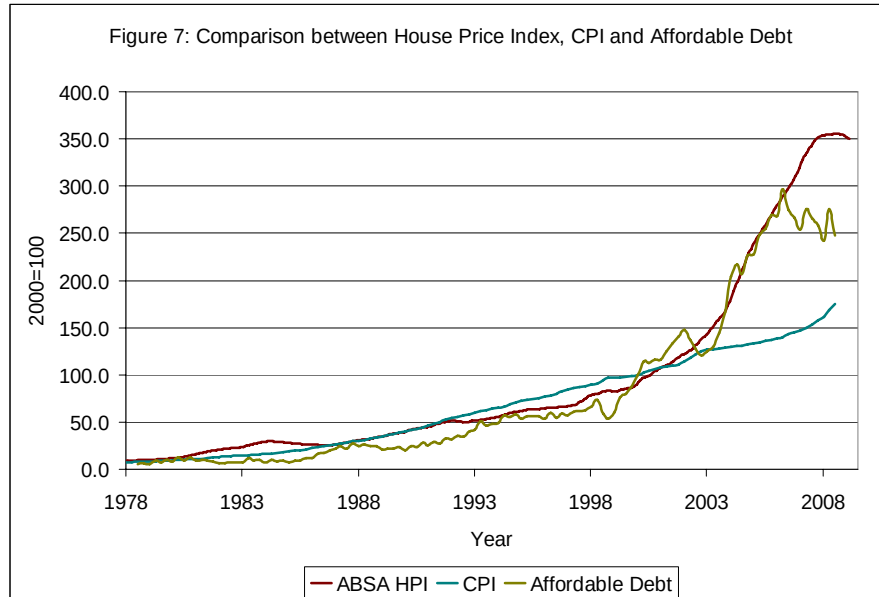
If it is accepted that households do not purchase certain goods such as houses cash, but rather finance it, it would mean that the disposable income of households should be sufficient to service the interest on the debt they commit themselves to, not the full debt amount. From function 2 above, it therefore holds that for a given disposable income, the amount of borrowed capital that can be afforded would vary for any change in interest rate. If we consider the situation and assume all disposable income is used for interest payment, the total value of debt that can be serviced by the disposable income is shown in figure 6. This is given as a factor of the index for disposable income where 2000=100.



It is however accepted that not all disposable income is utilised towards debt. In order to have the above graph comparable to other, it is re-calculated to be also on an index of 2000=100. This would then reveal the comparison between total affordable debt, CPI and the ABSA house price index as illustrated in figure 7.

Although there are some areas of lower correlation, it is clear to see that the general direction of movement is the same. The excessive increases in property values since the early 2000's appear to be warranted by affordability of this. It is however visible that affordability started to turn the other direction towards the end of 2006 already, while property prices still remained on their upward track. It is therefore not surprising that property prices now suddenly came to a halt, and even started to deflate. The same pattern could be seen in the early 80's as well as 90's when property prices increased above the general affordability curve.

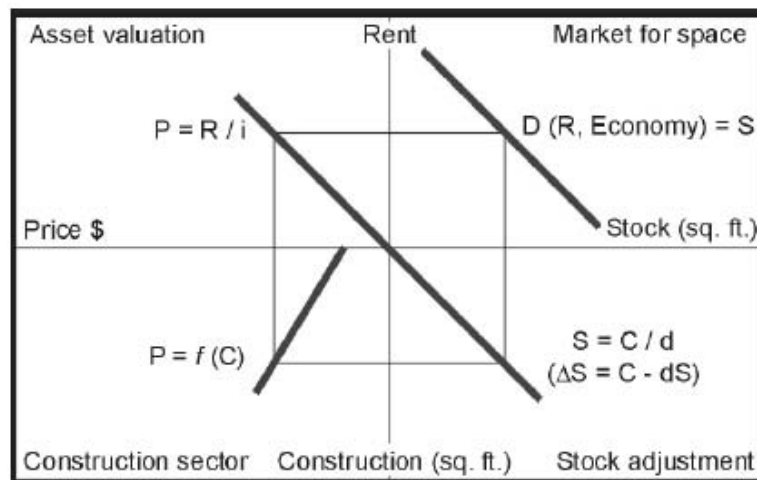
The phenomenon that prices still increase even though affordability slowed down or stopped could be due to investment literature of motivational nature, rather than informative technical details on investment principles. This causes investors that are not properly educated to be overoptimistic, that also entered the housing market and purchase residential properties, rent out for a year and sells at a 30% profit, but who don't know the signals for the end of the cycle, and thereby creating a fictitious demand and pushing values to a point above its intrinsic value.



2. THE CONSTRUCTION SECTOR

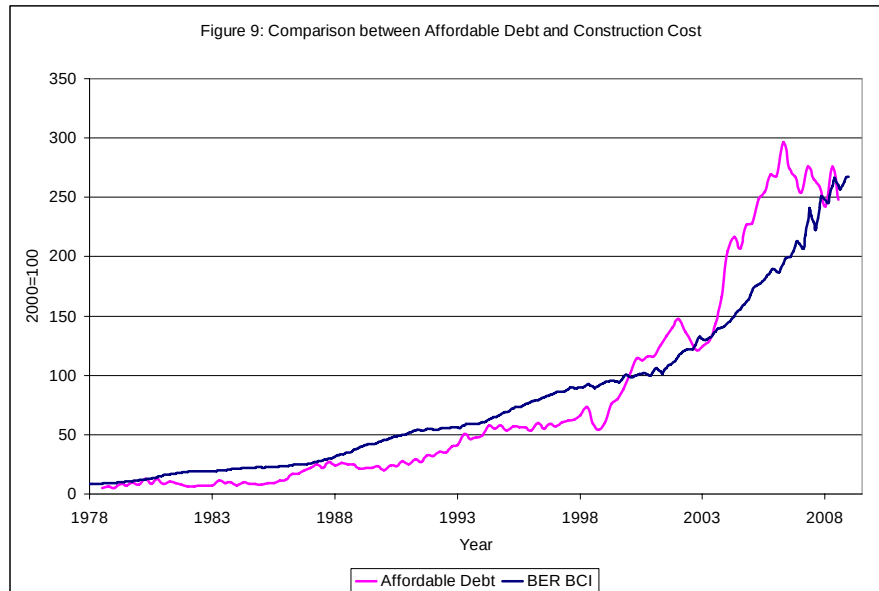
Achour-Fischer² presented an integrated property market model, the FDW-model in 1999. The first complete description of the model was presented in 1992, and is graphically shown in figure 8.

Figure 8: The FDW-Model



The model links the market for space to the capital market, which then flows over to construction and stock adjustment. The relevancy of this model for this paper is the principle that were presented that when property values rise above minimum construction cost, it acts as a trigger for new construction.

If it is therefore accepted that the affordable debt amount would dictate property values as presented in figure 7, an indication could be found for expectations on the construction activity if affordable debt is compared to construction cost, as published by the Bureau for Economic Research in their Building Cost Index. This is shown in Figure 9.



From the above it could be determined that construction was less in demand through the eighties and Nineties due to affordability. Only from early 2000, after interest rates settled and the Economic climate improved, was there indications for good construction demand. Unfortunately the situation changed to the current no-demand level. The effect of this can be seen in general construction volumes in the residential market, with a significant reduction in new residential developments that takes place.

3. SUMMARY

From the above it could be determined that gross domestic product and Interest Rates are two major indicators of the balance of variables. An article of Buanews, the official newsletter of the South African government, indicates that the GDP has slowed to a 0.2% growth in the third quarter of 2009, resulting in an average of 3.1% for the year, which is substantially lower than the average of approx. 5% for the successive four years. This would indicate that there is little drive for growth in disposable income. The article also mentions that the government would probably keep interest rates at its current levels, but should GDP growth fall further, they would have to consider reducing interest rates to stimulate the economy. This would indicate that although disposable income might remain stagnant for a while, debt affordability would increase due to the lower interest to be paid. The effect would be that the gap between property values and affordability levels would shrink, which would stimulate the economy

through activity in the real estate and possibly the construction markets. The GDP is hampered by poor international markets as well as the effect of lower activity in the real estate, finance and construction markets. The government's monetary and fiscal policies would therefore play a significant role in the future of these variables.

4. RECOMMENDATIONS FOR FURTHER RESEARCH

If we consider the combined views on construction cost, property values and increases in disposable income, the level of consumer price inflation seems questionable. House prices and construction costs followed CPI until early 2000's, and then increased substantially faster than CPI. The question could be raised if the two mentioned variables indeed don't follow CPI, or could CPI be undervalued? It is recommended that this be researched and considered what makes up the basket of the CPI, and if the basket is compiled correctly.

It is furthermore recommended that the principles as addressed in this paper be reviewed against economists' views on the forward trend of the individual variables, which could provide an indication of where the property and construction sector is heading, and its impact on the wider economic market.

It is also recommended that this study be performed on other countries and markets in Africa and elsewhere to review that applicability on those markets, and attempt to answer the intricacies of property and construction behaviour elsewhere.

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LOW COST HOUSING FINANCE SYSTEMS: SCANNING GLOBALLY SHOULD WE BE RE-INVENTING LOCALLY?

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ABSTRACT

Purpose of this Paper

The effectiveness of selected methods of financing low cost housing in South Africa is investigated and possible housing finance lessons from selected Latin American countries identified.

Methodology/Scope

The effectiveness of the main alternatives for financing low cost housing in South Africa and in Latin America is determined by means of criteria developed from principles suggested in the literature.

Findings

The causes of ineffectiveness of the main financial systems financing low cost housing in South Africa were identified and suggestions for increased effectiveness are offered by implementing lessons from selected Latin American countries facing similar problems.

Research limitations

Research is limited to “selected” finance options reviewing only the main finance options, and concentrated on “selected” countries that are comparable in terms of economic development and housing challenges.

Value

Without access to credit or subsidies most South Africans are too poor to afford even the lowest priced housing options. This study highlights causes of ineffectiveness of different financial systems and identifies proposals to make housing more affordable.

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1. BACKGROUND

The Housing Policy Framework in South Africa can be illustrated as follows:

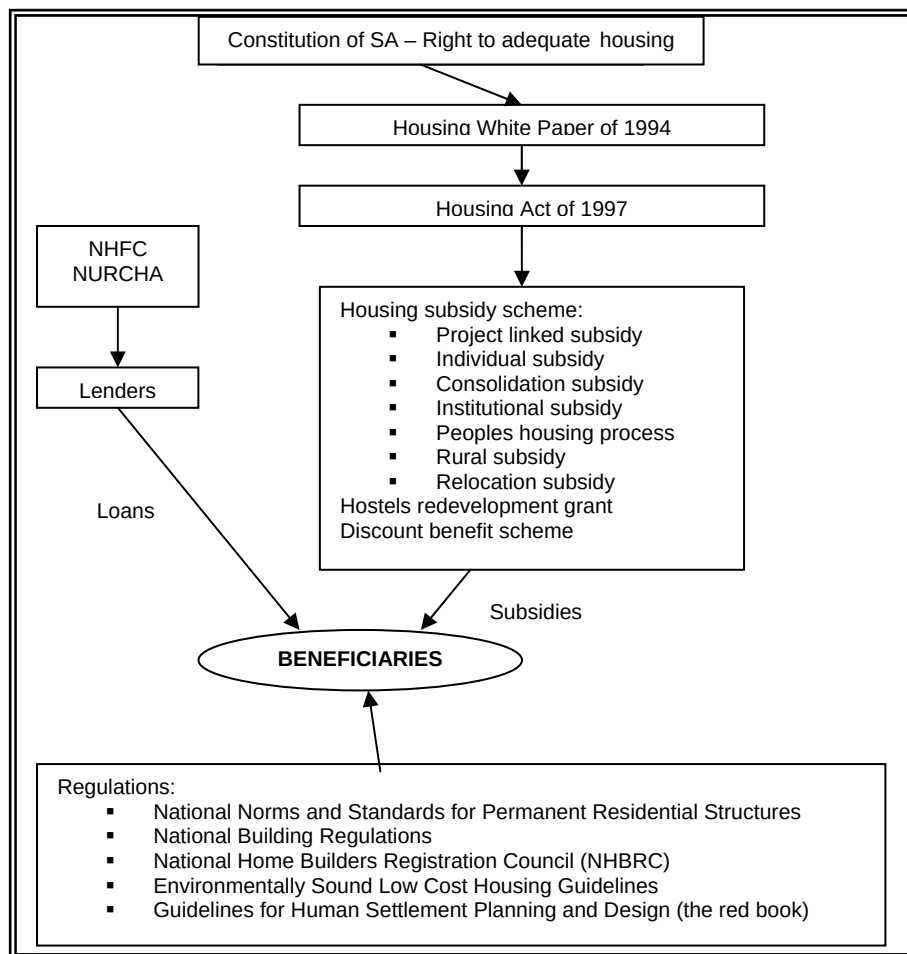


Figure 1: The Housing Policy Framework in SA. (NHFC = National Housing Finance Corporation; NURCHA = National Urban Reconstruction and Housing Agency). Source: Development Action Group, 2002 extracted from Urban Sector Network, November 2002

2. RANGE AND DIVERSITY OF FINANCE PROVIDERS OF HOUSING

Table 1 summarizes the major providers of housing finance in South Africa.

Table 1. Range and diversity of providers of housing (adapted from UN-Habitat, 2005)

Category	Description	Products	Examples
Provincial and Local Government			
Subsidies	In terms of the Housing Act of 1997 the Housing Subsidy scheme was devised with different types of subsidies to cater for various scenarios	Subsidy types: - Consolidation - Individual - Project Linked - Institutional - Relocation - Rural - Discount Benefit Scheme - Peoples Housing Process	Issued at provincial / local government level
Wholesale Finance Institutions			
Wholesale finance institutions	Providers of wholesale finance facilities that may be used by housing institutions for internal capital needs or for retail lending activities	Wholesale loans Institutional loans	Mutual Banks Banks (ABSA, Standard, Nedcor, etc)
Specialist housing finance institutions	Specialist DFI's established with state support in order to increase the number and capacity of housing finance organisations through providing inter alia wholesale finance. Regulated by special statutes	Wholesale loans Institutional loans	NHFC NURCHA RHLF THUF

Category	Description	Products	Examples
Retail Finance Institutions			
Banks	Commercial financial institutions regulated by Banks Act and Usury Act	Mortgage finance	Members of the banking council
Non-bank lenders	Institutions issuing medium to small loans or exempted for products below 10,000 rand	Securitized loans Personal equity based loans	NHFC South African Home Loans
Microfinance institutions	These are a subsection of non-bank lenders that grant unsecured personal loans which are exempt from the Usury Act and regulated by the Microfinance Regulatory council. These include normal microfinance institutions, niche market lenders and NGO lenders	Unsecured small loans Savings backed micro loans	Members of the Microfinance Regulatory Council
Housing institutions	Specialist housing institutions providing end-user financing for housing products using innovative tenure arrangements. Regulated by various laws, including Instalment Sale (alienation of Land Act, 1989)	Instalment sale products Rental tenure co-operative	Rental Housing Schemes (Johannesburg Housing Company, Social Housing Institutions (e.g. COPE) Instalment sale Institutions (e.g. Cape Town Housing Company)
Savings Institutions			
Savings linked credit institutions	Housing savings scheme linked to the provision of credit by microfinance	Savings linked credit	Instalment sale Institutions (e.g. Cape Town Housing Company)

Category	Description	Products	Examples
	institutions		Finance institutions (e.g. uTshani Fund)
Specialist savings institutions	Specialist institutions or schemes established to assist low income households to accrue savings for their 'own contributions'	Savings scheme	National Savings Scheme (NURCHA)
Guarantors			
Wholesale housing finance guarantors	Institutions that underwrite or provide guarantees to the wholesale loans for housing purposes	Housing-specific wholesale finance guarantees. "Hardship cover" guarantees for rental institutions/SHI	NHFC (specific guarantee) NURCHA HLGC
End-user housing finance guarantors	Institutions that provide Guarantees to the providers of the end-user housing finance (mortgage finance) on individual loans	Loan default guarantees AIDS guarantees	HLGC

3. ASSESSMENT OF SOUTH AFRICAN LOW COST FINANCING SYSTEMS

To evaluate the effectiveness of the various finance options, four main criteria were developed from the literature. (These criteria were also suggested by the De Loor Commission, South African Housing Advisory Council and Urban Foundation in evaluating finance systems prior to the "new South Africa")

Table 2 summarizes critical causes of ineffectiveness and areas to improve effectiveness, based upon the above criteria.

Table 2 Critical causes of ineffectiveness of different financing schemes.

Criteria of Assessment	Subsidies
To what extent are they solving the problem?	◆ 2,4mil houses delivered since 1994 accommodating approximately 9mil households. Backlog reduced to 2.2mil from 2.4mil ◆ Current delivery pace of 270,000 houses per annum. The national housing goal to increase delivery to 350,000 units per annum has not been achieved ($270,000/350,000 = 77\%$) ◆ The analysis of the data reveals delivery has not been consistent from year to year over the last 13 years and there is no evidence of an increased housing delivery trend
Which population are they targeting?	◆ Lower 40% of households in South Africa for whom housing credit is not a viable option ◆ Upper income bracket of subsidy scheme require end-user finance to access subsidy scheme ◆ Resident citizens that are legally competent, married or financially dependent and whose household income does not exceed R3,500 and have not owned property before ◆ Skewed allocation of housing funds between provinces ◆ Options to defaulting borrowers, where option of rehabilitating these mortgage loans is not affordable – relocation subsidy
What constraints exist, which could perhaps render the system ineffective?	◆ Minimum technical and environmental norms and standards for houses. NHBRC increases costs and debatable if adding any value ◆ Despite the establishment of the Special Investigating Unit, corruption, fraud and maladministration have been apparent for years now and despite harsh threat against culprits. Contractors and developers have also been alleged to be involved in corruption. What checks and balances have been put in place nationally to ensure integrity of the subsidies issued? ◆ Developers can access subsidy who might not always have the final occupants interest at heart – project linked subsidy ◆ Enables groups of people to work with a developer – project linked subsidy ◆ No incremental housing option – only for completed houses ◆ Beneficiaries have right to decide on how to use

	their subsidies either for service provision, on building of houses or a combination thereof ◆ Inadequate provision for inflation – subsidy amounts have not kept abreast with building cost escalations ◆ Unrealistic expectations – minimum standard and guarantees required for 5 years increase costs decreasing profit margins and drive developers to be involved in other more lucrative opportunities than the development of low cost housing
What is the effect of cost and time related to the establishment and administration?	◆ Sitting on large sums of unspent money budgeted for housing – “if you don’t use it. You will lose it!” ◆ Difficult to administer, very complicated application process, information to public insufficient, takes a long time before applicants receive subsidy (individual subsidy) ◆ Project linked subsidies assist developers with cash flow based on progress payments

Criteria of Assessment	National Housing Finance Corporation (NHFC)	NURCHA
To what extent are they solving the problem?	◆ Underperformance in project finance only disbursing 17% of target of R997mil ◆ A total of 29% (R297mil) disbursed of the target of R1,039 billion ◆ Commendable performance in wholesale finance issuing 4,556 micro loans	◆ Financing 150,000 houses by supporting 450 contractors and developers via 600 contracts (1995 – 2006) by providing guarantees for bridging loans. ◆ NURCHA makes grants to those trying to resolve conflicts that impede housing delivery
Which population are they targeting?	◆ Aimed at lowest possible income level able to afford credit on commercial basis ◆ Funds intermediaries via wholesale financing ◆ Variety of tenure options, in under	◆ Targets same population as subsidies ◆ Indemnifies housing institutions accessing institutional subsidies against losses resulting from non-payment by beneficiaries- addresses income risk by providing 3 months installments

	and un-served segments	
What constraints exist, which could perhaps render the system ineffective?	◆ Sustainability – depends on capacity of institution to service loan and beneficiary to pay rental. ◆ Supplements own capital with loans from life assurances, pension funds, etc. ◆ NHFC does not have access to subsidies thus cannot subsidise its lending rates	◆ Projects allocated to developers and/or contractors who don't have adequate construction skills – impacts on production rate ◆ To overcome communication barriers both the housing institution and beneficiary must undergo education and training
What is the effect of cost and time related to the establishment and administration?	◆ Credit on a sustainable and commercial basis to both traditional and non-traditional lending institutions	◆ Long delays in signing contracts once allocated – unproductive and thus limits the number of projects ◆ Late payments caused by administration processes – conflicting beneficiary lists, delays in registration of sites to beneficiaries, delays in inspections, lost claims and incomplete departmental reconciliations requiring additional submissions by contractors. ◆ Late payments by provincial housing departments for work done stall construction programmes and put pressure on cash flow

Criteria of Assessment	Banks – Mortgage Finance	Microfinance
To what extent are they solving the problem?	June 2007: Minister of Housing reported R38 billion (90.4%) versus the target of R42 billion to be achieved by 31 Dec 2008 set in the Financial Services Charter	2005: R5.6billion used for purposes of house-building 2002: R6.3billion disbursed for housing purposes
Which population are they targeting?	- Moderate-income (R3,000-R6,000) formally employed earners, with access to pension/provident fund withdrawal benefits and payroll deduction facilities +/- 70% of households excluded from housing credit via banking sector - Community banking – “cultivate feeling of ownership by establishing ‘roots in communities’	- Targeting those earning between R1,500 - R3,500 - Those unable to qualify and meet deposit for mortgage lending - Those informally or self-employed - For shelter investment in stages
What constraints exist, which could perhaps render the system ineffective?	- Governed by National Credit Act - Constitution, “no one may be evicted from their home...,” thus difficult to reposes from defaulters forcing banks to tighten lending criteria - Government failed to create appropriate environment A number of supporting systems have failed/underperformed - Protection via preferred debit order system – preferential creditor - Informality of tenure, informal employment, lack of sufficient income to service loan make lending impossible	- Governed by NCA, sets limits on the interest rates - Offers much smaller loans than banks - Operate in a largely unsecured market. Unions and employers prefer dealing with banks - Collection methods are a critical aspect of risk management - Offer unsecured smaller loans to borrowers who may be informally employed. - Loans repayed relatively quickly.

	◆ Pension/provident funds can reduce/remove deposit required and replacing it with collateral guarantees ◆ Banks required to conform to international best practice, i.e. prudence in lending practices and capital adequacy requirements ◆ Long-term mortgage facilities: 20 years ◆ MoU places emphasis on consumer and borrower education in an attempt to negate non-payment	◆ involves a direct interaction with the borrower which suggests a high degree of grass roots presence by the lender.
What is the effect of cost and time related to the establishment and administration?	◆ Smaller valued loans; higher interest rates to cover risk and admin charges ◆ Smaller, frequent loans preferred, better control over finances but more costly to administer ◆ Banks suited to debit order collections, because of the regulatory environment and because of administrative capacity to implement at scale and minimal cost.	◆ Offer loans where there is no costly bond registration costs ◆ Research has revealed that it is cheaper to take 3 small micro loans over 2 years each at 46% than a mortgage loan for 20 years at 20% interest

4. RECOMMENDATIONS TO INCREASE THE EFFECTIVENESS OF FINANCING LOW COST HOUSING

While there is no such thing as homogenous “Third World” across which identical models and instruments can be applied, South Africa can benefit from experiences in similar countries.

Incorporation of lessons learnt in Chile (Tokolia 1995; Lira, 1994; Gilbert, 2004), Brazil (Ferguson and Navarrete 2003; Mali, 2003), and Colombia (Arrietta, 1998; Fonseca, 1999; Gilbert, 2002; Gilbert, 2004) lead to the following recommendations (cf. Wadiwallah 2007):

- ◆ *To what extent are the financing options solving the problem?*

The key to solving the housing crisis for Chile was a high percentage of literacy and minimal growth rate.

The subsidy allocation could be made according to a point allocation system, considering factors such as percentage of family income saved, regularity of savings and size of applicant's family

The total finance cost per housing unit should comprise three amounts:-the amount saved by the family, the subsidy granted by the government and, if applicable, the long term mortgage through financial institution

Should we not acknowledge that it will be impossible to rid ourselves of all shack developments? Why not upgrade informal settlements? "Fevelas" in Brazil have been successfully upgraded via local civic association initiatives and municipality initiatives. Improvements are planned, financed and carried out by the residents themselves. Up-gradation takes place with or without legal tenure.

♦ *Which population are they targeting?*

It is essential to define beneficiaries at the onset of any scheme. Schemes that have been successful are those that aid people who are willing to help themselves. For instance when people are forced to enter into a savings agreement, which will form part of the finance for the housing, lesser default has occurred.

If the housing backlog is to be solved to any extent it should be made mandatory for employers to contribute to housing for all, not just their employees

♦ *What constraints exist in the loans and subsidy market, which could perhaps make the system ineffective?*

It is imperative that repayments are related to the family's income to ensure timeous repayments and avoidance of arrear payments

The subsidy amount should be inversely proportion to the housing unit price

The beneficiary family should be able to shop around in the open market for a housing solution to suit the amount of subsidy

Care should be taken in formulating regulations about employer contributions toward employee housing, because of the hold an employer could have on an employee.

Both savings and housing loans should be linked to the cost of living through indexation. The Colombian indexing is actually a system of accounting to which savings deposits are credited or increased with amounts sufficient to offset the rise in consumer price index, and the principle loans are debited, that is, reduced by the same rise

A constraint that discourages employers from contributing to housing is committing long term investments and below market rate returns

♦ *What is the effect of cost and time related to the establishment and administration of the loan and debt servicing ?*

The government can makes known each year through the media the total amount of subsidies granted and the areas where beneficiary families

reside. The private sector is therefore able to project future demand and plan on how to meet this demand

The delay and enormous cost involved in the procedure of obtaining housing can lead to land invasion

Chile has an extremely effective system of having just one ministry. This cuts all red tape delays. Furthermore an increase in subsidies/loans should not be followed by an increase in staff, but instead by an increase in productivity of existing staff

♦ *Do the systems specify how funds should be used?*

From the available international literature it could not be assessed whether funds were required to be used for formal, informal or incremental housing. In South Africa it is a reality that not everyone is able to afford formal housing. The informal housing sector should therefore also be catered for (cf. Datta and Jones, 2001; Hunzemayer, 2001; Sundberg and Thunstrom, 1998; Rust, 2002; Tomlinson, 2008).

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THE EFFECT OF SOCIAL-CULTURAL CONDITIONS ON INDIGENOUS HOMESTEAD FORM IN THE FORMER CISKEI, EASTERN CAPE, SOUTH AFRICA

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ABSTRACT

Purpose of this paper

The purpose of this paper is to define and describe the interconnections between the Xhosa traditional homestead and their aspects of culture.

Design/methodology/approach

The research was based on an ethnographical fieldwork conducted on ten homesteads in two villages in Peddie District, former Ciskei, in the Eastern Cape.

Findings

The results show that there is a connection between homestead layout and Xhosa culture. For instance, the cattle kraal is the physical and spiritual centre of the homesteads. In addition homestead design and layout closely follows the cultural values of stewardship, social responsibility, sufficiency and spirituality.

Practical implications

The paper enhances the understanding of socio-economic sustainability issues that affect choice, form and materials used in traditional homestead construction. It also enhances the understanding of linkages between values and religion and their effect on design of indigenous homestead systems

Value of paper

The paper shows that social cultural conditions aside of portraying cultural continuity by embracing traditional Xhosa religions, ethics and values, also affect homestead form.

Keywords: Xhosa, Homestead, Culture, Socio-economic, Values.

1. INTRODUCTION

Construction of houses has preoccupied mankind from time immemorial. Houses are built for protection against the vagaries of weather and to provide shelter for both social and commercial activities. The form houses take has usually been a function of cultural values, and prevailing economic and physical conditions (Wallbank et al., 1987). Ecological and demographic factors play an important part in building design (Oliver, 2006). Thus indigenous homesteads design seems to portray cultural continuity by embracing the religion, ethics and values of a community (Spence and Cook, 1983; Kennedy, 2001; Hirst, 2005). Within traditional African societies the major cultural values include stewardship, social responsibility, sufficiency and spirituality.

The stewardship realm involves preservation of the natural environment whereas social responsibility relates to how the community benefits from collective decisions (Talukhaba and Shakantu, 2002). Sufficiency concerns prudent exploitation of community resources and spirituality encompasses the creation of harmonious relationships with nature, members of the community, domestic animals and dwellings (Wells, 1993; Anderson and Sovre, 1995; Hirst, 2005).

In terms of the influence of the natural environment the major factors affecting house form include seasonal patterns of heat, cold, wind sun and rain prevalent in a region. There is therefore a relationship between the climate and the resultant house structures (Makaka and Meyer, 2006). Thus, in forest climates characterized by high rainfall and temperatures, dwellings need to exclude moisture and heat whereas in desert climates dwellings need to provide shade.

The use of indigenous materials allows for minimal mechanization and maximum labour input (Denyer, 1978; Frescura, 1981). The choice of site is determined by a number of factors ranging from the physical nature of the site to the social-economic and cultural values of a community (Wells, 1993). However, while the physical nature of the site, that is, proximity to water, agricultural, forest and grazing land are essential determinants, Rappoport (1969) posits that social cultural values have more influence in the selection of sites. The cultural framework emanates from the norms and values resulting from the interrelationships amongst people that exist within

an indigenous society (Spence and Cook, 1983; Kennedy, 2001). Oliver (2006) posits that, from the individual parts of the house to the entire village plan, each element has a religiously symbolic association, and totemic sanctuaries with markedly zoomorphic form are built and dedicated to the ancestors of the living. Therefore, culture forms a large part of the socio-economic fabric of a community which in turn is touted to have a major influence on the indigenous homestead form.

To investigate the effects of socio-economic conditions on indigenous homestead form, research was conducted in the Balanteni (Ripplemead) and kwaTweni (Naude's Hoek) villages in Peddie District in the former Ciskei region of the Eastern Cape from June to September 2006.

1.1 Research method

The research adopted the qualitative ethnographic strategy and employed purposive sampling in selecting homesteads to investigate. Data was collected through participant observation using physical investigation structured interviews. The structured interviews followed a pre-determined sequence by using standard questionnaires. This enabled the research team to maintain a consistent structure of interviews. The primary selection criterion was that the homestead should comply with Rukwaro and Mukono (2001: pp.85) definition, that is, '*... a homestead is defined as the composition of enclosure where occupants co-operate and undertake their dwelling activities. The people living in a homestead and who are usually related by blood were (are) taken as constituting a household.*'

The main objective remained to collect data pertaining to land tenure and site location, family organisation, living arrangements, livelihood, social organisation, beliefs, choice of site and general attitudes. The research results are given in the sections that follow.

1.2 Literature review

1.2.1 Cultural background of the people of Ripplemead and Naude's Hoek in Peddie

1.2.2 The Eastern Cape

The Eastern Cape is one of the nine provinces of South Africa. The coastal area of the Eastern Cape lies along the Indian Ocean between the Western Cape and KwaZulu Natal. On the other hand, the inland area lies on the periphery of the Northern Cape, the Free State and Lesotho

The topography is defined by a series of mountains and hills. Inland, these ranges reach extreme heights and extend to the 'altitudinous planes' of the Plateau and Great Karoo. Towards the coast, the mountains and hills are smaller and the land is defined by a series of rivers

These topographic inconsistencies are a result of the climatic conditions. The coastal areas experience long, hot, summer months and moderate winter. In contrast, the upper regions towards the Free State, the rise in the altitude results in lower temperatures. In addition, the Eastern Cape has two rainfall zones. The eastern regions experience two rainfall seasons, first during summer (December- January) and second during winter (June-August). In contrast, the western region experiences only one rainfall season

The climatic conditions have influenced the vegetation and soil properties of the region. The mountains are rich in alluvial soils, which support the hardwood forest and scrub forests that are evident in the region. Closer to the rivers and streams are clay and sandy loams which support a mix of grasses. Away from the rivers there is a variety of grasses that are consistent with the soil patterns (; Peires, 1981; Crais, 1992).

1.2.3 The Xhosas People

The majority of people in the Eastern Cape are Xhosa. The Xhosa were previously pastoralist-cultivators who migrated to Eastern Cape during the fifteenth century. Their origins are associated with a common belief that they emerged from a damp cave or clump of reeds in the east. Thus, the Xhosa believe that they are descendants of the 'River People' who stayed behind when others migrated. The 'River People' provide a connection between the past and the present (Hirst, 2005). The significance of this myth is reflected in the symbolic position of the homestead. In this regard, a homestead is placed between a forest and a river. A link can therefore be identified between their mythological belief in the 'River People' and their settling along ridges near streams and rivers (Crais, 1992).

1.2.4 Social organisation

Social groupings were defined by clanship with members of the same clan descending from a common forefather. The settlement arrangements reflected these social groupings (Crais, 1992).

1.2.5 Land allocation

Traditionally, the chief was responsible for apportionment of the land. The land allocation procedure was gender sensitive with married women being the recipients and custodians of the portions of the land allocated to their families (Soga, 1931).

1.2.6 Family organisation

The head of the homestead (*umninimzi*) was the senior male in the homestead. The homestead comprised of a group of people who could trace their decent to the same forefather. In most cases, the family

structure was nucleated with the *umninimzi* living with his wife and unmarried children. This was reflected in the spatial arrangement of the homestead. The spaces were divided in such a way that the head, wife and children had their own separate huts. Also the spatial divisions accommodated for sleeping, cooking, reception of visitors and storeroom.

The space between the gate and dwellings formed the courtyard (*inkundla*), which was used for social gatherings and formal activities (Soga, 1931; Peires, 1981; Crais, 1992).

1.2.7 Livelihood

The Xhosa's economic life traditionally revolved around the trading of cattle, copper, iron and beads. Wealth and prestige was symbolised by the acquisition of cattle. The importance of cattle in the lives of the Xhosa was reflected by the positioning of the cattle kraal at the centre of the homestead. Cattle were not only a means for acquiring and maintenance of wealth but also provided meat and milk (Peires, 1981).

Their economy was centred on the production of sorghum and cultivation of maize, sweet corn, pumpkins and melons. This was evident in the gardens that were located between the homesteads and the streams (Peires, 1981; Crais, 1992)

For the Xhosa, labour was divided according to gender and age. The men tended the cattle and erected the dwellings while the women cultivated, cooked the meals and maintained the dwellings (Crais, 1992).

1.2.8 Symbols and ritual orientation of homesteads

Xhosa folklore has it that cattle represented a critical intersection between economics, authority and cosmology. Thus, the role of cattle extended beyond their economic lives. According to Peires (1981), the slaughter and sacrifice of cattle was the principal means by which the ancestors were invoked. Cattle were also a key factor in the Xhosa social-economic structure because they were the only means of paying dowry for women (*lobola*). This critical role of cattle is symbolised by the positioning of the cattle kraal in the centre of the homestead (Peires, 1981).

Moreover, the cattle kraal was given the type of respect reserved only for sacred spaces. In addition kraals served as places for performing ancestral sacrifices such as slaughtering of cattle to thank the ancestors. The kraal space was also used to receive boys returning from seclusion initiation lodges as part of the traditional custom of circumcision. Circumcision symbolised the transition from boyhood to manhood. The boys, called *abakhwetha* were sent away and secluded for a period of up to six months to initiation lodges specially prepared for this purpose. At the end of the circumcision rituals the boys were taken to have discovered and

mastered the mysteries of manhood. The initiation ceremonies would conclude with the sacrifice of cattle to the ancestors in the kraal (Soga, 1931; Crais, 1992).

For girl initiates (intonjane) the ritual of female circumcision lasts about a week. It does not involve actual surgical operations. During this period the initiate must hide herself from view and observe food restrictions. The period involves dances and ritual sacrifices of animals (Zenani, 1992).

1.2.9 Death

Upon the death of a chief, it was customary in the Xhosa society to bury the chief in a grave located on the left hand side of the gate of his cattle kraal. This symbolised that the spatial division within the homestead accommodated for the performance of their ritual customs (Soga, 1931).

Also, upon the death of the chief or the senior male, the homestead would be shut and left to crumble. Therefore the beliefs associated with death were reflected in their practices with respect to their housing (Soga; 1931; Peires, 1981).

1.3 Research findings

1.3.1 Land allocation

Currently the land allocation is undertaken by the chairperson of the community.

Moreover allocation is no longer based on gender as any family member can obtain a plot.

1.3.2 The family unit

Each household has an average of 8 members. In most homesteads surveyed the family structure comprised of an extended family incorporating at least three generations. In 62.5 % of the homesteads the head of the family was the oldest man. The other 37.5% were headed by the oldest women.

The family structure has not had a major influence in the spatial divisions between members of the homestead. However in three cases where the head of the family was a man, a separate hut was reserved for him. In two homesteads, the head women shared their huts with their grandchildren.

1.3.3 The dwelling unit with respect to sources of livelihood

From the surveyed homesteads, only 12.5% had a vegetable garden on the banks of the river. In addition, only 50% of the surveyed Homesteads kept cattle in their yard. However, even homesteads that did not possess cattle still had kraals within their homesteads. The kraals investigations

showed, were still needed in case a daughter got married and dowry was settled in cattle terms or if there was a funeral in the homestead, there would be need to keep cattle to be sacrificed in the kraal. From the interviews it was apparent that cattle had a number of uses for the household. These uses include food provision, *lobola* and traditional ceremonies. The tail can also be used to make necklaces for children. Some of the surveyed households suggested that cattle were a good source of income.

All the homesteads also keep domestic animals such as dogs, chickens and goats. The dogs are kept in dog kennels while chickens have dedicated huts (*ihoko*). The chickens are used as food for income generation. Goats are kept in purpose built enclosures resembling cattle kraals. The goats can be used as sacrifices at traditional ceremonies and for income generation.

The above findings suggest that the homesteads rely on their cattle and other domestic animals for a variety of conveniences. This reliance is demonstrated in the accommodation of animal enclosures within the homesteads.

1.3.4 The homestead

Although different many respects the ten (10) homesteads surveyed had certain features in common. These included that:

- The yards are open with no enclosures;
- The cattle kraal occupies the central position in the homestead;
- A space is left open between the dwellings and the cattle kraal (*inkundla*); and
- The dwellings' door openings face the cattle kraal.

The distinguishing factors between the homesteads were the number and type of dwellings and the presence of other structures such as the kitchen hut, chicken house and pit latrine. The homesteads had an average of 2 thatched mud circular huts (*rondavels*). Three of the homesteads had a kitchen hut within the yard. Six had chicken houses. Three of the homesteads had pit latrines.

There were no visible boundaries between neighbouring homesteads. Features such as trees and large rocks were used to define the boundaries of homesteads. In addition, the site configurations were irregular. This factor posed difficulties in measuring the areas of individual homesteads. However on average the size of the yards were about 2200m².



Figure 1: View of homestead from cattle kraal

The homestead in relation to domestic activities

1.3.5 Meals

Generally, food was either prepared in one of the huts in the homestead, in the kitchen hut or outside within the yard. The centre of the kitchen hut (*iziko*) was used for cooking purposes.

Meals were served inside the huts. In most cases the members of the homestead ate together in one hut. However, in one homestead the head (man) ate alone in a separate hut whilst the rest of the family ate in another. In another homestead the parents ate in one hut and the children and grandchildren ate in another hut.

1.3.6 Water

There were basically three sources of water: rainwater, the river and wells. The water that has been collected from the river and wells is kept inside the huts in drums and buckets. The rainwater was collected outside in drums.

1.3.7 Heating and lighting

Firewood was used for cooking while paraffin lamps and candles were used for lighting. The firewood was collected from the nearby forest. For the residents of Ripplemead, it took an approximately three hours to harvest firewood from the forest. While for those from Naude's Hoek it took between 20 minutes and 2 hours. The firewood was stored in stacks located within the yard.

The wood was also used for heating purposes in winter. Charcoal blazers (*'imbawula'*) were used for provision of portable heating.

1.3.8 Visitors

Visitors and friends were received either in the courtyard (*inkundla*) or the huts. Although some homesteads lack some basic facilities, in most aspects the spatial arrangement of the homestead is convenient for performance of domestic activities. The homestead allows for storage of food, water and wood, cooking and dining sleeping, bathing, waste disposal and reception of visitors.

In many aspects the traditional layout of the homestead has been maintained where symbolic spaces such as the cattle kraal and *inkundla* are present. These spaces have been identified as being the centre stages for performing traditional ceremonies. The layout of the dwellings facilitated traditional ceremonies. The importance of cultural values attached to the symbolic spaces (cattle kraal and *inkundla*) ensures cultural continuity.

1.3.9 Symbolic and ritual orientation of the homesteads

The symbolic and ritual orientation of the homesteads influences cultural beliefs and the utilisation of internal spaces within the huts and other spaces within the homestead. For instance, the interior of the hut is fitted out with modern fitments. There were only two households where hand-made furniture was found. Nevertheless cultural artefacts such as goat horns, spears (*imikhonto*), drums and *iminqayi* were found in some huts. The ceiling space was used to accommodate some of the artefacts.

Although the internal spaces of the huts are highly modernised, the ceiling has been designed in such a way that homesteads are able to embrace the cultural values within their homes. The inclusion of artefacts like 'iminqayi' and spears symbolise the importance placed on traditional rituals relating to circumcision and ancestral sacrifice (Crais 1992; Soga (1931). Hence, these artefacts illustrate that the cultural values and traditions of the households are maintained to ensure cultural continuity.

1.3.10 Death

Only two of the respondents shared instances where their previous homesteads had been shut down and abandoned after the death of a family member. In one homestead, two graves were found inside the yard next to the cattle kraal. These graves entombed a father and his son. According to the one of the surviving children, it was customary in their family to bury the men in the yard.

The custom of burying the dead chief within the yard still occurs. The finding suggested that the spatial arrangements in the homestead illustrate that there is sufficient yard space for the burial of family members within the yard. Homesteads continuing with their custom were in effect also ensuring cultural continuity.

1.3.11 Choice of site

The selection of sites seemed to be derived from individual preferences because all the respondents had differing reasons for selecting the site. Some of the reasons given were as follows:

- Their forefathers had died on the land;
- The ground conditions were suitable for building;
- The sites were close to the forests and well clear of other homesteads;
- The sites did not have any springs; and
- The sites were close to the river

In essence 50% of the respondents based their choice of site to proximity to sources of livelihood such as water and firewood. In addition, the proximity to grazing land was also an important factor in site selection.

2. CONCLUSIONS

The exploration of the cultural background of the people of Ripplemead and Naude's Hoek in Peddie in the former Ciskei, Eastern Cape illustrated that their cultural beliefs, values and practices were reflected in their settlement patterns and arrangements of homesteads. For instance, the cattle kraal was the physical and spiritual centre of the homestead.

The spatial layout of the homesteads accommodates all space requirements of the households. Households perform their daily domestic activities within the homestead. Enclosures for cattle and other domestic animals included in the homestead illustrate the dependence of the homesteads on livestock for livelihood. The incorporation of symbolic spaces ensures that the households are able to perform their cultural rituals within the homestead. In addition the internal space facilitates the expression of cultural beliefs by incorporating artefacts, which embrace the values attached to some of their traditional customs.

The materials necessary for construction are drawn from the immediate environment. The consistency of the construction technology between the different households illustrated that a particular culture of building exists within the community. The design and construction of the indigenous homesteads takes cognisance of households' cultural beliefs, values and practices. This therefore suggests that socio-economic conditions affect homestead form. The spatial arrangements of the homesteads take cognisance of daily domestic activities and the safety of domestic animals. Domestic animals provide food and income.

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FACILITIES MANAGEMENT: ASSESSMENT OF A PRIMARY BODY OF KNOWLEDGE FOR EDUCATION IN SOUTH AFRICA

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ABSTRACT

Purpose

Globally the development of property, being part of the creation of fixed investment and wealth, is taking place unabated. The absence of an universally acknowledge profession, designated to manage and optimise the utilisation of the ever compounding fixed investments in the products of the collective built environment, is observed. The objectives of this research are to establish a suitable educational knowledge framework and to address the existing shortcomings.

Design

The problem at hand is to extract, from the present international practice of facilities management, a body of knowledge and secondly to formulate the results in terms of suitable tertiary and continuing education programmes to address shortcomings in South Africa.

Findings

The results of this research found application in the enhancement of an existing short continuing education programme and the introduction of a new three-year tertiary education programme in a school for the built environment.

Value

The value to be realised out of the structuring and presentation of formal educational programmes in facilities management is that a neglected area of the built environment family of disciplines are being addressed and

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elevated in South Africa, to what is fast becoming the norm elsewhere in the world.

Practical implications

By offering formal education in facilities management a meaningful contribution will be made to satisfy the obvious dire needs of the private, and particularly the public sector, to optimize the utilisation of the products of the built environment through continuous improvement of those facilities in a scientific and sustainable fashion, to the best advantage of all the stakeholders.

Keywords: Facilities management, body of knowledge, tertiary and continuing education, built environment.

1. INTRODUCTION

Investment in properties, as fixed assets, is growing continuously internationally. These property development activities are served by a multitude of highly skilled professionals such as engineers, architects, quantity surveyors, construction managers, project managers, town planners, land surveyors and others. The absence of a universally acknowledged profession of the same standing, designated to manage and optimise the utilisation of the ever compounding fixed investments in the products of the collective built environment (buildings, engineering structures and infrastructure), is remarkable. This situation may be explained by the fact that, in the present day accepted vocabulary, facilities management as a managerial concept developed in the United States of America only during the 1970's, when a Facilities Management Institute was founded and the first known formal symposium was held in Washington DC in 1989 (Binder 1989). Though these events started approximately 30 years ago, the development and spread were slow, and in comparison with the other built environment professions, it is still in its infancy. However, although perhaps lacking some of the prestige associated with other professions, there are reasons to believe that facilities management is one of the fastest growing "new professions" in the built environment. Furthermore, it is becoming evident that facilities management is in the process of becoming a driving force, not only of scientific management and optimisation of fixed assets, but as an initiator of development in the built environment.

2. LITERATURE SURVEY

Literature was selected by undertaking a web search in order to identify and obtain suitable works regard facilities management and by identifying and utilising known local South African works, commonly used by training and education providers. The contents of the following literature have thus been analysed in order to establish what appears to be representative of a general knowledge profile in literature: Barret and Baldry (2006), Bender (2002), Best, Langston and de Valence (2003), Cloete (ed) (2001a), Cloete (ed) (2001b), Cloete (ed) (2002a), Cloete (ed) (2002b), Collins and Porras (2000), Cornwell (1973), Cotts and Rondeau (2004), Crocker (1990), de Vries (2001), Grulke (2001), Gross (2002), Friday and Cotts (1995), Hauptfleisch (ed) (Volume 1&2) (1999), Hauptfleisch and Sigle (2007), Magee (1988), Means Company (1996), Occupational Health and Safety Act (2003), Owen (1993), Pearce and Robinson (2000), Project Management Institute (2004), Robinson (1999), Rondeau, Brown and Lapides (2006), Seeley (1987). To this was added those knowledge areas regarded to be of importance in continuing education programmes and in formal academic degree programmes.

Table 1.1 provides an analysis flowing from surveying the sources as described above, divided into three categories: Firstly dealing with the “contextualising of the managerial challenge”, secondly with the “practice” of facilities management and thirdly with “property maintenance”. The topics contained in Table 1.1 are in main heading format, synthesised from comprehensive subdivisions.

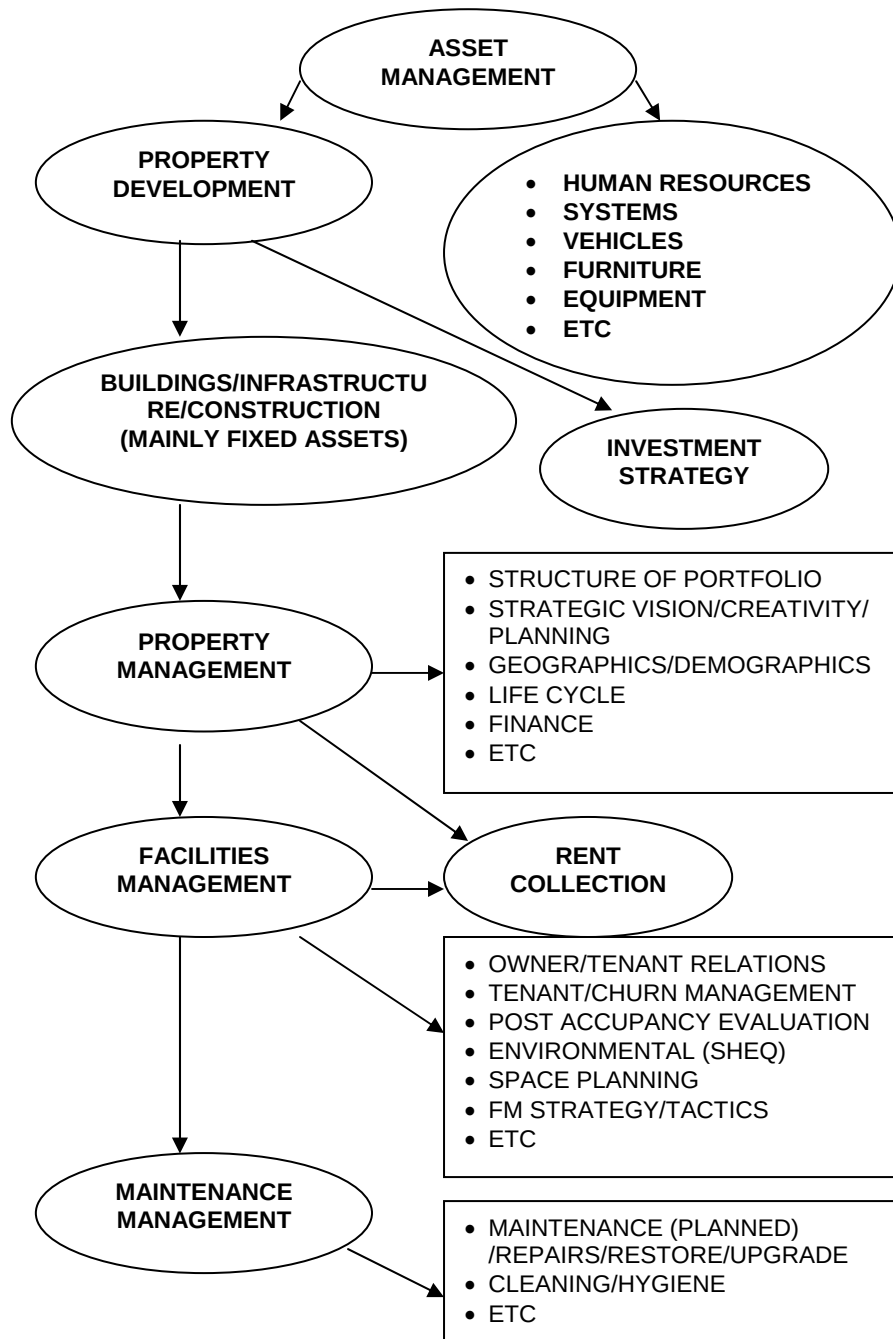
It should be noted that the literature survey covers sources from 1973 to 2007 but that the bulk of it has been published since 2000. For this reason no attempt was made to place the development of a knowledge profile on a developmental time scale. Figure 1.1 therefore represents an attempt to provide a contemporary “balance sheet” rather than a “developmental pathway”.

3. METHODOLOGY

The problem at hand is to extract a body of knowledge from the present practice of facilities management, and secondly, to formulate suitable tertiary and continuing education programmes. This was done through literature study and by obtaining feedback from facilities management practitioners attending continuing education short courses (in order to create a limited statistical sample), and from non-quantified observations in practice. A qualitative and quantitative survey was conducted amongst stakeholders in order to obtain their views regarding a proposed three-year tertiary education programme on under-graduate (degree) level. Figure 1.1 shows the generally perceived position of facilities management, in context

of overall asset management, within an enterprise that holds built environment assets. This diagramme was tested for general correctness by subjecting it to assessment by 12 different groups of facility management practitioners taking part in continuing education short courses over a period of four years.

Figure 1.1: Facilities Management in Context of Asset Management



The general support that it received was taken as indicative of actual facilities management practice in South Africa, offering some guidance in the creation of a primary body of knowledge for education.

From Figure 1.1 it is clear that the research done was not hypotheses testing. The intention was to establish current thinking regarding facilities management, thus contributing towards the development of academic programmes, pre-empting the needs of industry, resulting in a structured knowledge profile, validated by a broad group of stakeholders.

4. UNDER-EMPHASISED KNOWLEDGE AREAS

The knowledge areas that are perceived as important for practicing facilities managers and the relevant emphasis of each in the surveyed literature are reflected in Table 1.1. This analysis is not substantiated by quantitative and triangulated research procedures, but has value as an attempt to observe general tendencies to under-emphasise perceived important knowledge areas, required in a primary body of knowledge for the development and practice of facilities management.

Table 1.1: Facilities Management Primary Body of Knowledge

KNOWLEDGE AREA	COVERAGE IN LITERATURE			
	OFTEN → SELDOM			
	1	2	3	4
A. FACILITIES MANAGEMENT: CONTEXTUALISING THE MANAGERIAL CHALLENGE				
1. INTRODUCTION TO FACILITIES MANAGEMENT	•			
2. AN OVERVIEW OF FACILITIES MANAGEMENT	•			
3. DEVELOPMENT OF FACILITIES MANAGEMENT	•			
4. FACILITIES MANAGEMENT PRACTICE MODELS	•			
5. GENERAL MANAGEMENT FUNDAMENTALS				•
6. STRATEGIC MANAGEMENT		•		
7. PROJECT MANAGEMENT				•
8. HUMAN RESOURCES	•			
9. LAW AND CONTRACTUAL ARRANGEMENTS		•		

10. FINANCE	•			
11. MARKETING OF SERVICES			•	
12. TOTAL QUALITY MANAGEMENT				•
13. SERVICE LEVEL ARRANGEMENTS	•			
14. INFORMATION TECHNOLOGY	•			
15. SUCCESSFUL FACILITIES MANAGEMENT		•		
B. FACILITIES MANAGEMENT: PRACTICE				
1. STRUCTURING THE ORGANISATION			•	
2. CLIENT AND/OR USER NEEDS EVALUATION	•			
3. DESIGN TO SATISFY CLIENT AND/OR USER NEEDS	•			
4. SPACE MANAGEMENT	•			
5. CONSTRUCTION TECHNOLOGY, BUILDING SERVICES AND COMPONENTS		•		
6. QUANTIFICATION AND TENDERING				•
7. PRINCIPLES OF LIFE CYCLE COSTING		•		
8. GENERAL SERVICES				•
9. CAPITAL PLANNING		•		
10. PROCUREMENT & OUTSOURCING			•	
11. RISK MANAGEMENT		•		
12. POST OCCUPANCY EVALUATION	•			
13. BENCHMARKING	•			
14. THE STRUCTURE OF THE BUILT ENVIRONMENT				•
15. OCCUPATIONAL HEALTH AND SAFETY ACT AND REGULATIONS	•			
C. FACILITIES MANAGEMENT: PROPERTY MAINTENANCE				
1. INTRODUCTION TO MAINTENANCE MANAGEMENT	•			
2. MAINTENANCE CATEGORISATION	•			
3. PLANNING AND PROGRAMMING OF MAINTENANCE EXECUTION	•			
4. OPERATIONAL MANAGEMENT		•		
5. PEST CONTROL IN BUILDINGS			•	

6. MAINTENANCE FINANCE	•			
7. CONSTRUCTION, RENOVATION AND MAINTENANCE WORK		•		

5. ANALYSIS OF CONTINUING EDUCATION SHORT COURSES EVALUATION

Table 1.2 is based on the results obtained from a limited quantified 100% covered survey, assessing broad disciplines covered during continuing education short courses, soliciting recommendations regarding course content. Delegates are also prompted to make alternative suggestions. This survey has been conducted six times (from 2004 to 2007) amongst delegates, after they have completed a five-day continuing education short course offered to middle (and top) management practitioners of facilities management. Table 1.2 contains the results that emanated from the last three courses offered during 2006 and 2007. These courses are always well subscribed. Delegates that are required to take part in the above survey are also evaluated by way of assignments, in order to support continuous quality improvement.

Table 1.2: Recommendations for Continuing Education Programme Content Weighting

KNOWLEDGE AREAS	ACTUAL LECTURE %	RECOMMENDED LECTURE %
Management (assets, property, facility, general)	35	34.1
Client care	6	7.1
Finance	15	13.9
Legal	18	17.2
Quality	13	12.9
Maintenance	13	14.8
Total	100	100

From the results reflected in Table 1.2 it is concluded that the respondents that have attended continuing education short courses, are satisfied that the course content is on target.

6. ANALYSIS OF SURVEY REGARDING PROPOSED ACADEMIC PROGRAMME OBJECTIVES AND OUTCOMES

Based on the results reflected above, a three year academic programme has been structured, to be offered in a distance learning format, as follows:

- Year One: Facilities Management Introductory Certificate (NQF Level 5: 80 Credits)
- Year Two: Facilities Management Intermediate Certificate (NQF Level 6: 80 Credits)
- Year Three: Facilities Management Advanced Certificate (NQF Level 6: 80 Credits)

Note: Some of the course contents/subjects may be offered as credits towards obtaining a BSc-degree.

The proposed contents of the above programmes/certificates have been subjected to a quantitative and qualitative survey in order to assess the validity thereof. Three stakeholder groups that could contribute to this process were identified and requested to take part in a survey. The quantitative results are reported in Table 1.3.

- Group 1: Practitioners that have participated in Continuing Education Short Courses. Response rate 20%, number 18.
- Group 2: The South African Property Owners Association (SAPOA) Facilities and Technical Services Committee members. Response rate 18%, number 4.
- Group 3: The South African Facilities Management Association (SAFMA) management committee requested prominent members to participate. Response rate unknown, number 4.

All participants in the survey were provided with details of the proposed course content, including the objectives and outcomes of each subject.

The focus of the survey was to determine to what extent the curriculum content was regarded as important. This assessment of a primary body of knowledge for a three year educational programme was conducted regarding the following quantitative data:

Table 1.3: Responses by stakeholder groups
QUESTIONNAIRE ON PROPOSED THREE YEARS COURSE
CONTENT FOR CERTIFICATE PROGRAMMES IN FACILITIES
MANAGEMENT

1. Your response (x) should please indicate the importance of each subject as per the attached proposed modules for certificates in facilities management over a three year period.
2. Not important: 1
Most important: 5

GRP 1	GRP 2	GRP 3

FIRST YEAR: FACILITIES MANAGEMENT INTRODUCTORY CERTIFICATE (NQF 6:80 credits)

1.1	DQF 104: 16	Descriptive Quantification	4.12	4.25	3.50
1.2	COE 104:16	Building Economics	4.47	4.00	4.25
1.3	SBE 102:8	Structure of the Built environment	4.41	4.00	4.00
1.4	FAM 100:40	Facilities Management	4.88	4.75	4.75
	AVERAGE		4.47	4.25	4.13

SECOND YEAR: FACILITIES MANAGEMENT INTERMEDIATE CERTIFICATE (NQF 6:80 credits)

2.1	DQF 204: 16	Descriptive Quantification	3.58	4.00	3.50
2.2	COE 204: 16	Building Economics	4.29	4.00	4.00
2.3	CSC 304:16	Construction Science	4.17	4.25	4.00
2.4	EGS 202: 8	Engineering Science	3.76	3.25	4.00
2.5	FAM 206: 24	Facilities Management	4.88	4.75	5.00
	AVERAGE		4.14	4.05	4.10

THIRD YEAR: FACILITIES MANAGEMENT ADVANCED CERTIFICATE: CREDITS 80

3.1	COE 304:16	Building Economics	4.17	3.75	4.00
3.2	CCM 306: 16	Construction Contracts and Management	4.35	4.00	4.67
3.3	BSC 304:16	Building Science	3.76	4.00	4.25
3.4	PDE 302:8	Property development	4.29	3.25	4.00
3.5	FAM 308: 32	Facilities Management	4.52	5.00	5.00
	AVERAGE		4.22	4.00	4.38

NOTE:

Group 1: From the 213 questionnaires delivered 19 responses were received (8,9%)

Group 2: From 22 committee members 4 responses were received (18.2%)

Group 3: It is unknown how many questionnaires were circulated, from which 4 responses were received.

Table 1.4: Average arithmetic results from all respondents on a 5-point scale

RESPONDENTS	VALUE
Table 3: Course Participants	4,28
Table 4: SAPOA Committee members	4.10
Table 5: SAFMA members	4,20

From Tables 1.3 and 1.4 it can be concluded that the proposed three year courses enjoy comprehensive acceptance and that the courses' contents are on target.

The qualitative data that was obtained is not reported on in detail. It basically constitutes guidelines/suggestions and does not distract from the outcomes of the quantitative surveys.

7. CONCLUSIONS

The knowledge gained from offering continuing education short courses, expanded with the analysis of a literature survey, non-quantified observations of academia and practice, and quantitative and qualitative surveys, this attempt in assessing a proposed primary body of knowledge for facilities management rendered useful information. Being a "new" discipline makes it a moving target that requires continuous evaluation and development, particularly regarding the structuring of tertiary education programmes.

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EDUCATION AND CHALLENGES OF FEMALE ARCHITECTS IN TANZANIA

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ABSTRACT

Purpose

This paper focuses on women's under-representation in the academic side of architecture with the goal of seeking solutions to glaring gender imbalances. Female representation in the architecture profession in Tanzania is very low in all areas, be it in architectural firms, at the construction site, or in teaching and research. This paper offers empirical data regarding the gender imbalance at the School of Architecture and Design (SADE) at Ardhi University (ARU) and possible explanations for this imbalance. In particular,

Design/methodology/approach

The methodology used is interviews and data gathered on women's participation at SADE - Ardhi University.

Findings

The findings show the level of women's representation in academia in the subject area of architecture. The paper concludes by suggesting that SADE and ARU must make a greater effort to end gender disparities by efforts to attract, train and retain more female architects thereby creating a larger pool of professional women with the requisite skills and qualifications to build architectural careers both in and outside of academia.

Originality/value

The paper contributes to the understanding the status of women's enrolment to study architecture, their retention rate, and key challenges facing female students.

Keywords: architecture, gender disparity, female, higher education, Ardhi University (ARU), Tanzania, Africa

1. EMPIRICAL EVIDENCE OF A GENDER IMBALANCE IN HIGHER EDUCATION IN THE FIELD OF ARCHITECTURE

The present situation at SADE (the only institution for training architects in the Tanzania) in regard to gender balance shows that women constitute a small minority of the students as well as teaching staff. The student male – female ratio in the department is 10:1, and for the teaching staff the male – female ratio is 16:1.

1.1 Undergraduate Student Enrolment

The proportion of female students enrolled in SADE continues to be low in relation to that of male students. This is evident, for example, in the data from the year 1996 up to the present. Table 1.1.1 provides enrolment figures in SADE (PMU, 2006).

Table 1.1.1: First Year Student Enrolment in SADE at ARU

Year of enrolment	Total students	Number of female students enrolled	Women as % of students enrolled
1996/97	30	4	13%
1997/98	18	2	11%
1998/99	28	2	7%
1999/00	32	2	6%
2000/01	33	4	12%
2001/02	35	1	2%
2002/03	39	3	7%
2003/04	31	0	0%
2004/05	41	3	7%
2005/06	32	2	6%
2006/07	54	10	18%
2007/08	41	7	17%
2008/09	51	5	10%

Source: PMU - Programme Management Unit, *UCLAS facts and figures*, September 2006, SADE records, 2009

In looking at the enrolment figures it is striking that the five year period from 2001/2 to 2005/6 was characterized by low women enrolments (under 10%) with an inability to attract more than 3 students into the school for any single year including no women students enrolling in 2003/4, only 1 enrolling in 2001/2, and only 2 enrolling in 2005/6. While it is encouraging to see jump in enrolment rates since 2006/7, it is not yet clear that this is

part of a trend of upward enrolment figures for women. Without conscious efforts to retain and attract new students the positive momentum that began in 2006/7 could be lost as evidenced in a downward trend in the years 2007/08 and 2008/09.

Turning our attention to the overall numbers of women students studying architecture, considering the low enrolment rates, they are unsurprisingly also discouraging. Currently SADE has only 28 female students out of a total of 229 students, which makes the representation of female students to be only 12.2%. Table 1.1.2 provides data for six years of evidence showing low numbers of female students at ARU. Table 1.1.2 also highlights the fact that SADE had the lowest or second to lowest percentage of female students compared to other departments at ARU for every year from 1999/00 to 2006/07.

Table 1.1.2: Total Undergraduate Enrolment 1999/00 – 2007/08 in ARU by Schools and Percentage of Female Students

Academic Year	SADE			SCEM			SURP			SEST			SRES			SGST		
	M	F	F%	M	F	F%	M	F	F%	M	F	F%	M	F	F%	M	F	F%
1999/00	95	6	6.3	101	8	7	60	5	8.3	105	22	20.9	77	14	18	91	8	8.7
2000/01	128	8	6.2	113	11	9	65	13	20	104	24	23	93	14	15	91	7	7.6
2001/02	138	6	4.3	139	14	10	85	16	18	104	36	34.6	107	18	17.1	93	10	10.7
2002/03	156	9	5.7	141	16	11	114	28	24.5	109	38	34.8	126	24	19	106	12	11.3
2003/04	159	7	4.4	144	21	14	128	20	15.6	111	43	38.7	147	26	17.6	115	12	10.4
2004/05	165	6	3.6	150	21	14	126	33	26	113	47	41.5	148	42	28	125	12	9.6
2005/06	174	8	4.5	179	23	12.8	146	37	25.3	132	39	29.5	166	53	31	140	8	5.7
2006/07	178	20	11.2	185	35	18	172	43	25	159	40	25.1	199	62	31	145	4	2.7
2007/08	175	22	12.6	205	35	17	194	54	28	157	27	17.1	237	81	34	134	3	2.2

SADE – School of Architecture and Design; SCEM – School of Construction Economics and Management; SURP – School of Urban and Rural Planning; SEST – School of Environmental Science and Technology; SRES – School of Real estate; SGST – School of Geospatial Sciences and Technology (**Source:** Gender Unit, ARU Gender Policy, 2008)

Low numbers of female students enrolled in the School of Architecture and Design reflects the small number of female applicants (see table 1.1.3). Additionally, the data in table 1.1.3 shows that not all female students who apply are accepted into the architecture programme. This might be because of not reaching the qualifications for admission. The rejection rates for males and females is roughly the same but the number of female applicants is very low compare to that of males accounting for the low rates of female enrolments in the school. Table 1.1.3 shows the number of women and men who applied to study architecture in over the past five years and their acceptance rates.

Table 1.1.3: Architecture Students Applications vs Admitted Candidates

Academic Year	Applied			Admitted		
	Total	Female	Male	Total	Female	Male
2000/01	77	9 (12%)	68 (88%)	33	4 (12%)	29 (88%)
2001/02	88	3 (3%)	85 (97%)	35	1 (3%)	34 (97%)

2002/03	66	3 (5%)	63 (95%)	39	3 (8%)	36 (92%)
2003/04	55	2 (4%)	53 (96%)	37	1 (3%)	36 (97%)
2004/05	64	2 (3%)	62 (97%)	40	1 (3%)	39 (97%)

Source: University of Dar es Salaam facts and figures 2004 /05

1.2 SADE Teaching Staff and ARU governance

Gender imbalances seen for students in the School of Architecture and Design at ARU are also reflected in the teaching staff and in the top management of ARU. For example, during the 2008/09 academic year women represented only 6% of the teaching staff in the School of Architecture and Design with only two women out of a total of thirty-two. This is a female to male ratio of 1:16. In addition to the insufficient number of female teaching staff, women in general are underrepresented in the decision making structure of ARU as can be seen in table 1.2.1.

Table 1.2.1: The Gender Profile of Top Management at ARU

Position	Female	Male
University Council	5	10
Planning and Finance Committee	3	6
Senate	4	30
Vice Chancellor	0	1
Deputy Vice Chancellor	0	2
Dean of schools	0	6
Dean of Students	1	0
Directors	2	5
Heads of Departments	1	5
Heads of Units	1	4

Source: Gender Unit, ARU Gender Policy, February, 2008

In this governance and management profile of ARU, few positions (22.5%) are held by women and there are no female architects among them.

2. CAUSES OF LOW REPRESENTATION OF FEMALE ARCHITETS IN THE ACADEMIC FIELD OF ARCHITECTURE

2.1 Students Enrolment

Women make up approximately 50% of Tanzania's population, so why are they such a small proportion of students in the School of Architecture and design at ARU? In data gathering, interviews were conducted with SADE students and staff representatives, including the dean, heads of

departments and female staff. The questions were formulated for the students and staff to gain explanations as to why there is a low number of women studying architecture, and to seek the respondent's opinion about what should be done to reverse the situation at SADE.

One possible explanation for the above situation is that there is something, perhaps biological, or otherwise inherent about being a woman that prevents them from studying architecture. But an internet search turned up information that in Europe men and women study architecture at roughly equal rates. For example, in Finland where the first European woman graduated in architecture 1890, the proportion of female and male architecture students has been nearly 50:50 since the 1970s (www.archoc.com). If individual women can study and make architectural careers in other countries at rates proportional to men, then this means there are no inherent biological reasons why women in Tanzania should consistently be under-represented in this field.

To explain the gender imbalance in the architectural field in Tanzania, one must look at prevailing societal cultural practices, government policies, and the actions, norms, and policies that are found within the sub-culture of architecture in Tanzania. Rather than engaging the debate about 'mfumo dume' or patriarchy in Tanzanian society, the paper will focus instead more specifically on the architecture profession in Tanzania, and in particular on SADE to look for causal variables to explain the gender imbalance found in the academic side of the architectural profession.

Why is it that at ARU - SADE female architecture students are significantly less than their proportion in the overall student body? One possible explanation from the interviews is that the SADE has failed to create a comfortable and supporting environment for its female students. Exacerbating an already low representation of female students in SADE, 33% of female students enrolled from 1996/1997 to 2001/2002 did not complete their architecture degrees. Table 2.1.1 gives evidence regarding the retention of undergraduate students, an important issue for SADE, considering the low number of students who originally enrolled in the five-year course of study.

Table 2.1.1: Number of Female Graduates in the Department of Architecture

Year	Number of female students enrolled	Number of female students graduated
1996/97	5	4
1997/98	2	1
1998/99	2	2
1999/00	2	1
2000/01	4	2
2001/02	1	0
2002/03	3	-

2003/04	0	-
2004/05	3	-
2005/06	2	-
2006/07	10	-

Source: UDSM facts and figures, 2004 – 2006; Department of Architecture Internal Records

Of those who did not finish their architectural studies, two students switched to other courses of study, two dropped out, and one died. In the year 1997/98 there were only two female students who enrolled in architecture. However, after a few weeks, one student, who was also admitted to the University of Dar es Salaam (UDSM) main campus, left to pursue her studies there. The loss of female students in the department also happened in the academic year 1999/00 to 2001/02 for different reasons including sickness (UDSM facts and figures 2006).

2.2 Recruitment of Female Academic Staff

An insufficient number of female academic staff is the result of a low number of female students enrolling as undergraduates, coupled with low retention rates, thereby creating a small pool of potential applicants for academic positions. Other reasons include a lack of interest in pursuing an academic career and an academic performance which does not qualify women for academic careers. Recruitment of academic staff is mainly based on a pool of departmental graduates with a cumulative GPA of 3.8 or above. For the past 6 years, only three female students have met the cut-off point of a GPA of 3.8 to qualify them for a teaching position in architecture

2.3 Main Challenges Faced by Female Students and Teaching Staff

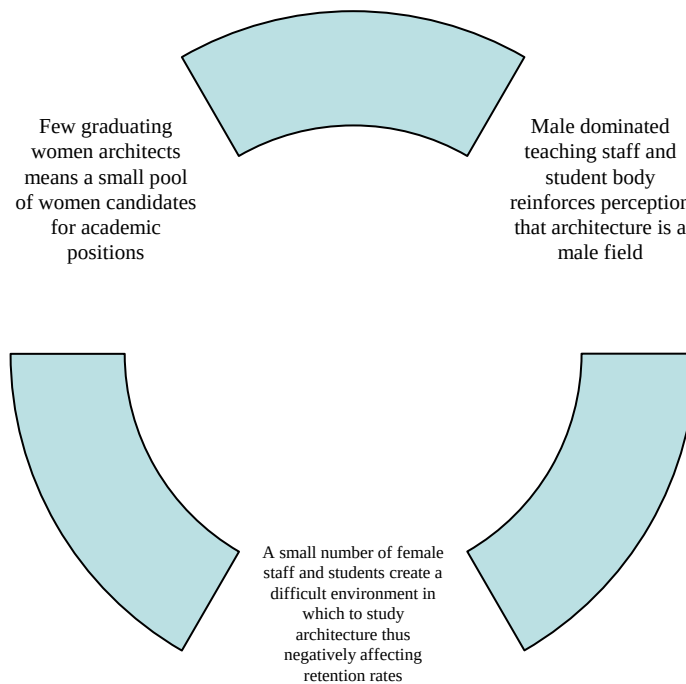
Based on interviews with female students and teaching staff at SADE, there are two main challenges that women architects face in academia, namely the lack of female role models and sexual harassment.

2.3.1 Lack of Female Role Models

There are not enough female role models in the school to encourage others to join the field. This creates a negative cycle whereby a male dominated teaching staff and student body reinforce existing perceptions of architecture as a male dominated field. Consequently the department attracts a small number of women students. Due to the lack of female teaching staff, who can better empathize with the problems of women students and with whom female students might feel more comfortable approaching with their problems, some women do not complete their studies in architecture. With a small and sometimes non-existent pool of

graduates, few if any women are recruited into the department setting the stage for the cycle to repeat itself.

Figure 2.3.1 Cycle of Male Domination of Architecture



2.3.2 Sexual Harassment

The UDSM Gender Dimension Programme Committee, (UGDP, 2003) rated sexual harassment as the number one gender issue that faced the university population. Different forms of sexual harassment exist. According to a recent study on sexual harassment at the University of Dar es Salaam 26.2% of the 733 respondent indicated that they were sexually harassed. The type of sexual harassment included verbal, non-verbal, physical, and inappropriate messages. Interestingly, there is an underreporting of sexual harassment as only 16% of the cases were reported (UGDP, 2006). Having to work and study in a male dominated department creates special challenges for women. Male students are often insensitive to women's concerns and engage in hurtful actions and comments, either out of ignorance or purposefully. Being a small minority under-represented at all levels makes it difficult to counter both insensitive and purposefully malicious male actions.

3. THE WAY FORWARD: CREATING AN ENABLING ACADEMIC ENVIRONMENT FOR WOMEN IN ARCHITECTURE

The empirical evidence clearly shows that in higher education, architecture is failing to attract and retain talented women. The situation is alarming and it calls for extra-effort to empower women to join the field and hence increase the number of women in this male dominated field. As a university degree in architecture serves as a crucial step in attaining professional accreditation for most architects, any effort aimed at empowering women in the wider field of architecture must address the crucial issue of gender imbalances at the university level.

3.1 Strategies to Increase Women Enrolment at ARU

Facilitating a more equitable ratio of male to female students in architecture requires more than just increasing female enrolment at ARU and in SADE, although this is an important first step and more needs to be done in this area. Creating an architectural profession that better represents Tanzanian society in terms of gender also requires creating the school of architecture that values women staff and students and that is committed to fashioning an academic environment in which both women and men feel comfortable. It is a challenge to all architects and to the students to address the gender imbalance in our academic field.

3.1.1 Attracting Female Students

The empirical data indicates that the School of Architecture and Design has a disproportionately small number of female applicants. In order to address this problem two strategies should be employed. The first is to create an interest in architecture through outreach programmes among potential female students studying in Tanzanian secondary schools. A second way to push up the numbers of female students is to slightly relax their entrance requirements.

In order to generate a greater interest in architecture, special outreach programmes targeting girls' high schools should be instituted. As part of this effort, SADE could support the establishment of a local women architecture career day where architects, students, and teaching staff would come together at ARU to provide information on the architectural careers to visiting girls' high school students to attract them into the profession. Additionally, when the department conducts out-reach programmes at mixed secondary schools, it must make sure that opportunities are provided for women students and that staff to participate and make special appeals to female students. SADE will have to consider

slightly relaxing admission requirements for female students. This should have a short-term positive impact on female student enrolment rates.

3.1.2 Retaining Women Students

It is time for SADE to deal with the challenge of retaining its women students. One way to do this is through developing empowerment activities targeting female students. These programmes can include a first-year orientation for women students and continuing forums for women students to come together to discuss their problems and to build their courage, confidence, and self-esteem.

3.1.3 Improving the Academic Performance of Women Students

What can be done to improve the academic performance of women students? A special orientation program, designed and supported by SADE, that includes academic issues, would help to raise the academic achievement of women. Another action SADE could take is to create and support a peer mentoring programme where advanced students would mentor their newer colleagues at ARU with their course work and studios.

3.2 Strategies to Increase Women Staff at SADE

If successful, over time, efforts to increase female enrolment at SADE, to retain female students, and to encourage academic excellence will lead to an increased pool of qualified females capable of applying for academic positions. However, in the short-term, and consistent with current ARU policies, SADE needs to implement affirmative action policies to redress gender gaps.

For example the ARU Gender Policy of 2008 calls for preference to be given to female graduates in regard to hiring and retaining teaching assistants and awarding postgraduate teaching assistantships. SADE should reconsider the qualifications it uses to recruit teaching staff. A larger pool of candidates for academic positions can be created in the short term by slightly relaxing the grade point requirement for academic positions for women candidates. For example, with the current GPA standard of 3.8, only three women for the six year period from 1999 to 2008 were qualified to apply for academic positions. If the GPA was relaxed by .1 that would have increased the potential applicant pool by two candidates. If the GPA was relaxed by .2 that would have doubled the available female applicant pool, while relaxing the standard by .3 would have increased the pool from 3 to 8.

3.3 Strategies to Bridge the Gender Gap in the Field of Architecture

3.3.1 Establish a Forum for Female Architects

In whatever the profession, no one can succeed in what they are doing without a little help from friends, or as we Tanzanians are fond of saying *Kidole kimoja hakivunji chawa* (one finger cannot kill a tic). Networking is essential for career advancement in architecture and women need to do more in terms of building their career networks. A forum for female architects can be established with the aim of raising the profile of women within the profession. The forum will provide a platform for women architects to meet, share experiences, and jointly lobby the government and top officials at ARU for better academic and non-academic career opportunities. Regardless of whether a forum is created or not, given the extreme under-representation of women in our profession, both men and women architects need to act as mentors for new female graduates and young professionals to enable them to successfully build their careers.

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CONSTRUCTION HEALTH AND SAFETY CULTURE IN SOUTH AFRICAN SMALL AND MEDIUM ENTERPRISES

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ABSTRACT

Purpose

Construction health and safety (H&S) culture in small and medium construction enterprises (SMEs) has received little attention in South Africa, in terms of either research or support for preventive initiatives. Previous research suggests that this sector has serious problems exacerbated by limited access to human, economic and technological resources. Moreover it is now recognized that methods developed specifically for large firms cannot necessarily be transferred to smaller and medium firms, hence the need to investigate the H&S culture in SMEs.

Methodology

This exploratory study is based on descriptive survey using semi-structured and structured questionnaire, and non-probability sampling to give an overview of the characteristics of H&S culture and practices in SMEs firms in the South African construction industry.

Findings

The findings indicate that commitment to H&S, support of health and safety, goal setting and review of H&S, creating structure and process that promote H&S and reviewing leaders' performance/self improvement are part of H&S culture of SMEs. Internal and external communication is also used to address health and safety issues.

Value

The results will be used to make an initial evaluation of SME H&S culture and practices to design and evaluate future interventions and research.

Keywords: Construction Industry; Health and Safety Culture; Small and Medium

1. INTRODUCTION

The construction sector in developing countries plays a significant role in physical development and employment of the otherwise largely unemployed labour force. There are however major challenges to increase the productivity of the sector in developing countries including low levels of macroeconomic performance, limited resources, reliance on institutional structures and procedures largely inherited from developed countries which once ruled them and poor infrastructural development (Gibb & Bust 2006). In the wake of these challenges, it is not surprising that construction in developing countries contributes a large quota to occupational accidents statistics. In comparison with developed countries, construction sites in developing countries are ten times more dangerous than in developed countries (Hämäläinen *et al.* 2006). The construction industry in South Africa is the third most hazardous industry after agriculture and manufacturing (Construction Industry Development Board (CIDB, 2004).

Small and medium sized businesses dominate the construction industry in many developing countries Kheni *et al.* (2008). These SMEs are constrained by limited resources as well as regulations and procedures which make it difficult to effectively manage the health and safety aspects of their operations. The quality of working conditions needs to be improved particularly for construction (Addo-Abedi, 1999). Gounden (1997) states that, the South African construction industry and especially SMEs have the potential as a driver of economic growth, despite the South African government commitment to improving productivity of the sector being low.

Improving the H&S performance of the sector is one means of enhancing the productivity of the construction sector in South Africa, which is dominated by SMEs (Ntsika, 2001).

In addition to the constraints mentioned above, SMEs lack the capacity to undertake large construction because contracts are packaged to suit large contractors. In the face of scarce resources and these

constraints, many of them are unlikely to commit sufficient amounts of funds and the right types of resources in the management of H&S (CIDB, 2004). Although SMEs possess common features with larger companies, their characteristics and management make them unique.

The National Small Business Act (1996), amended in 2004 defines small contractors as those with a total turnover of between R3m to R6m, a total number of full time paid employees between 20 and 50 and a total gross asset value (fixed property) of between 0.5m to R1m, whereas medium contractors are defined as having a total turnover of between R6m to R26m, total full time paid employees between 50 to 200 and have a total gross asset value (fixed property) of between R1m and R5m.

2. BACKGROUND TO OCCUPATIONAL HEALTH AND SAFETY MANAGEMENT

According to Kheni, *et al.* (2007) the rate of industrialization in developing countries require effective Occupational Health and Safety (OHS) administrative systems to control hazards and to provide decent working environments that meet international standards. High rate of occupational accidents, particularly in construction means developing countries might be poor at managing the risks of hazards at workplaces.

Studies conducted by Peckitt *et al.* (2004); Gibb & Bust (2006) on health and safety (H&S) management in construction in developing countries provide ample evidence of lapses in the management of H&S at construction sites. Their findings revealed weaknesses in occupational health and safety administration, economic conditions, climatic conditions and the characteristics of the construction industry of developing countries influence H&S at construction sites. Also, the effective implementation of H&S programs is absent in most construction businesses in developing countries. Haupt and Smallwood, (1999) indicated that the construction industry in South Africa shares in many of these problems of H&S management. These sentiments provide an avenue through which this study was initiated.

2.1 Occupational health and safety culture derived from literature review

The term safety culture first made its appearance in the International Atomic Energy Agency's (IAEA) initial report following the Chernobyl disaster (IAEA, 1986). Since then inquires into major accidents such as the King's Cross Fire (Fennell, 1988) and Piper Alpha (Cullen, 1990) have found faults in the organizations structures and safety management systems, throwing the importance of safety culture into the spot light. The Human Engineering Research Report (2005) agrees there is a wealth of

information, articles and reports relating to safety culture, yet there is still no universally recognized and respected definition or model.

In many cases the term safety culture has emerged with a meaning that appears to be very similar to that for climate (HSC, 1993) and, as noted by Cox & Flin (1998), the terms are often used interchangeably in many areas of literature. A more refined definition of safety culture and climate are:

The safety culture of an organization is the product of the individual and group values, attitudes, perceptions, competencies, and patterns of behaviour that determines the commitment to, and the style and proficiency of, an organization's health and safety management (HSC, 1993).

Whereas Zohar (1980) and Gonzalez-Roma *et al.* (1999), describes [health and] safety climate as a construct that captures employees' perceptions of the role that [health and] safety plays within the organization. It is regarded as a descriptive measure reflecting the workforce perception of and attitudes towards health and safety within the organizational atmosphere at a given point in time.

A literature review established elements that are associated with successful health and safety management which are; commitment by management, effective management system, risk management and control of hazards, auditing of both management systems and physical hazards, training and education, communications and consultation (National Occupation Health and Safety Commission (NOSHC, (1999). These and some other identified elements were used to address the research problem.

2.2 Health and safety culture within South African construction SMEs

The Occupational Health and Safety Act (OHSA) 1993 and the Construction Regulations 2003 set out a legal framework for workplace H&S. Specific sections of the Act apply to the development of policies and procedures, and employers' general duty of care, which states that:

"... provide and maintain so far as is practicable for employees a working environment that is safe and without risks to health" (OHSA, 1993 8(1) pp12). Occupational health and safety should be seen as a value and not driven by a legal framework.

Despite isolated reports of improvement, there is very limited commitment to comply with basic requirements, let alone promote a culture of health and safety. Employers view health and safety as a cost in the system. Small contractors can barely maintain tools and regard safety equipment as luxury items. Even where protective clothing and equipment are provided, workers often avoid their use, including the use of safety goggles and masks when working with grinders and asbestos. Aside from the direct compensation and medical costs associated with accidents the costs to the economy are immense and include rework, lost time, damage

to plant and equipment, disruption, productivity loss and loss of skills to the economy (CIDB, 2004).

Compliance with construction legislation, codes and standards such as the Construction Regulations (2003) in South Africa and the Construction Design and Management Regulation (2007) in the United Kingdom (U.K), presents significant challenges involving cost, compliance, design and implementation capacity. Clients such as the Department of Public Works (DPW) and consultants agree that implementation would require better understanding on the implications and importance of H&S (CIDB, 2004). These views highlight the importance of determining the H&S culture in the construction industry among SMEs.

3. PROBLEM STATEMENT

Employees of construction SMEs are exposed to hazards which cannot be ignored, as international funding bodies and some clients of the construction industry demand that SMEs demonstrate corporate social responsibility in respect of a decent working environment and physical environment. The South African government needs to address these issues to increase productivity of the construction sector in line with its growth program. To address these problems and concerns this study aims to:

- Establish the sample composition of the respondents;
- Determine required health and safety leadership skills;
- Determine the health and safety culture of SMEs in the construction industry; and
- Determine how health and safety is communicated.

This paper reports on the findings of an exploratory survey of health and safety conducted among SMEs personnel in-charge of H&S.

4. RESEARCH METHODOLOGY

A review of the literature led to the identification of available elements to manage a health and safety culture. Eight (8) elements were identified in the plethora of literature available. A descriptive survey method was adopted, which involved the use of a semi-structured and structured questionnaire in an in-depth exploration of the constructs underlying the subject matter of the research. Creswell (1994) describes a survey as a quantitative or numeric description of some fraction of the population – the sample, which enables researchers to generalize their findings from a sample of respondents to a population within the limitations of the sampling method.

A random sampling was used where the researchers selected sample members to conform to some or other criterion in this case

contractors. As no sampling frame exists and no parameters are known, probability sampling could not be used. The respondents were involved in construction activities ranging from general contractors, civil contractors, home builders, subcontractors and specialist contractors. Sixteen (16) usable completed questionnaires were gathered from a total of thirty-nine (39) distributed, 41.03% was the response percentage. This sample size was sufficient to meet the statistical test requirements for group statistical testing of an exploratory study. As part of the delimitation process (Creswell, 1994) of this research, the geographical aspect of the sampling limits the generalization of the sample. Purposive sampling is a non-probability method of sampling it is impossible to evaluate the extent to which such samples are representative of the relevant population (Welman & Kruger, 2001), it also gives the research qualities of a case study (Creswell, 1994). These problems with generalizing from the sample to the whole population of SMEs are limitations of the research design and fully acknowledged in this research.

The structured questions were analyzed using statistical formulae to calculate the mean values of the statements indicated in Tables 3 to 10. This resulted in the computation of mean value and ranking of the statements.

The data was gathered by the intercept method (Cooper & Schindler, 1998) using self-administered questionnaires (Leedy, 1997). The need for content validity was not established as no, pilot study and pre-testing was done on the questionnaire. As the questionnaires were completed anonymously, the collection of the data and the presentation of this report cannot harm the respondents or the organizations in any way.

5. RESULTS AND DISCUSSION

5.1 The sample composition of the respondents

Table 1 Type of organization

Organization type	Respondents	%
General contractor	6	37.5
Sub-contractor	6	37.5
Civil contractor	2	12.5
Specialist contractor	0	0
Home builder	0	0
Other	2	12.5

Most contractors were involved in general contracting (37.5%) and sub-contracting (37.5%) as indicated in Table 1. As evidenced from Table 2, of the sixteen (16) respondents, 31.25% were involved in construction at top management level, 25% as health and safety representatives, the rest of the respondents i.e. site managers, contracts managers, site agents, project managers and a quantity surveyor accounted for 43.75%

representation in managing health and safety. This finding indicates the passiveness of using health and safety practitioners to manage health and safety activities. The majority of the respondents have been involved in the construction industry for average 9.38 years and 93.75% had a qualification above Matric. The number of permanent employed employees in the past three years was on average 13.38 with an average turnover of R307.78 million.

Table 2 Profile of sample

Type of position	Respondents	%
CEO/Managing director	5	31.25
Contracts manager	2	12.5
H&S officer	4	25
Site manager	1	6.25
Project manager	2	12.5
Quantity surveyor	1	6.25
Site agent	1	6.25
Education qualification	Respondents	%
Matric	2	12.5
Certificate	5	31.25
Diploma	4	25
Degree	4	25
No qualification	1	6.25
Permanent employees		
Average number of permanent employees	13.38	
Annual turnover		
Average annual turnover	R307.78 million	
Number of years in the construction industry		
Average number of years in the construction industry	9.38 years	

5.2 Health and safety leadership skills in SMEs in the construction industry.

Table 3 Health and safety leadership skills

Action	Mean	Rank
Influence the perceived importance of H&S among staff and other management	4.25	1
Inform workers on how best to respond to unsafe behaviour	4.25	1
Show a caring and humanistic attitude of H&S to their employees	4.08	3
Recognize and reward appropriate H&S behaviours	4.08	3
Actively listen to employees on issues of H&S	4.00	5
Consult with stakeholders inside and outside the organization on H&S matters	3.92	6
Influence the perceived importance of H&S among people outside the organization	3.85	7
Demonstrate commitment to H&S	3.83	8

Table 3 indicate that leadership skills in H&S are vital to enhance a positive health and safety culture in SMEs'. The mean score achieved among the respondents indicate that leadership skills influence the perceived importance of H&S among staff and other team members and informing workers on how best to respond to unsafe behaviour as these attained a mean score of 4.25 and are ranked 1st. Majority of these statements had a mean score of between 3.5 to 4.5, which indicate that H&S leaders should process most of these skills.

5.3 Health and safety culture of SMEs in the construction industry.

The results in Table 4 indicate that there is commitment among management pertaining to health and safety management. The statements are in the band 3.5 to 4.5 which indicates that the respondents agreed that management was committed to health and safety management. The results further indicate that the respondents are not involved directly in reviewing serious incidents and also do not frequently receive reports on health and safety and allowed to comment on them, this is indicated by the low mean rate.

Table 4 Commitment of leadership

Action	Mean	Rank
Actively involved in formal safety deliberations such as safety policy formulation.	4.42	1
Accept responsibility for H&S on equal basis as any other area of management responsibility	4.25	2
Take explicit and continuing steps to ensure that their interest in, and commitment to health and safety is known to all personnel	4.17	3
Involved directly in decisions to remedy the causes of serious incidents	4.08	4
Take proactive steps to plan and organize work to maximize health and safety, minimize production health and safety conflicts, rather than only intervening when conflicts arise	4.00	5
Demonstrate visible and positive commitment to H&S throughout the management style.	4.00	5
Involved directly in the review of serious incidents	3.75	7
Receive reports and publicly comment upon them	3.58	8

Table 5 Support given by leadership

Action	Mean	Rank
Ensure that staff are adequately trained, instructed and motivated to follow H&S procedures	4.33	1
Provide a safe working environment that suits the activity and tasks of their workers	4.33	1
Provide their staff with safe technology suitable for their activities and tasks	4.25	3
Provide training and operating instructions on H&S taking into account non-literate workers	4.08	4
Assess the quality of training and general usefulness, relevance and applicability of H&S training	3.92	5
Ensure staff are released from their commitments and participate in H&S training	3.67	6

Table 5 indicates that there is support of health and safety by leadership. There is indication that training is provided on H&S including taking into consideration non-literate workers. There might be resistance of releasing the respondents to participate in H&S training as this aspect scored the least mean in this category of element.

Table 6 Goal setting and review of leadership H&S

Action	Mean	Rank
Regularly review compatibility of their safety performance goals	4.17	1
Have clear goals and objectives for their H&S performance	4.08	2

The respondents agreed that leadership regularly review compatibility of their safety performance and have set clear goals and objectives for their H&S performance. This is a clear indication that there are goals set to improve health and safety performance.

Table 7 Creating structure and process that promote H&S

Action	Mean	Rank
Ensure feedback on the safety performance of the organization and its management	4.08	1
Remove excessive layers of management and empower people to make decisions within their area of authority	4.00	2
Review and change how the organization gets its staff to participate in the review and improvement of H&S	3.33	3

Management tends to promote H&S culture by creating structures and processes that are friendly and reachable among its employees as indicated in Table 7. Staff members who participate in the review and improvement of H&S has a mean of 3.33, which indicates that sometimes they are involved to create structures to promote H&S.

Table 8 Reviewing leaders' performance/self improvement

Action	Mean	Rank
Incident investigation are used as opportunities to review and learn constructively about leadership issues	4.08	1
Leaders receive feedback on how others, including their staff, perceive their commitment to H&S	3.92	2

The results in Table 8 indicate that reviewing leaders' performance /self improvement is agreed upon by the respondents as the mean score is, in the band 3.92 to 4.08, incident investigation and a feedback process is revealed to the leaders to enable them to improve their performance.

5.4 Health and safety communication

The result in Table 9 indicates internal communication is used to address H&S issues. Leadership often communicate with managers from other sites on H&S matters, provide quick and effective action to complaints from their workforce regarding their working environment H&S and respond swiftly to concerns and queries raised by the workforce and /or other managers as these actions had a mean above 4.00. Sometimes leadership internally communicated on H&S as 6 (six) out of the 10 (ten) statements had a mean rating of between 2.50 to 3.50. At times communication was conducted informal between managers and workforce

Table 9 Internal communication

Action	Mean	Rank
Communicate with managers from other sites on H&S matters	4.17	1
Provide quick and effective action to complaints from their workforce regarding their working environment, health and safety	4.08	2
Respond swiftly to concerns and queries raised by the workforce and /or other managers	4.00	3
Discuss health and safety matters with the workforce, listening concerns and queries	3.67	4
Participate in setting H&S targets and explaining this to staff	3.42	5
Communicate formally with managers and workforce	3.42	5
Explain clearly H&S goals and objectives to staff	3.42	5
Keep staff informed about outcomes of any meetings regarding H&S matters	3.42	5
Communicate directly with health and safety practitioners	3.33	9
Communicate informally with managers and workforce	2.83	10

Table 10 External communication

Action	Mean	Rank
Respond to queries or complaints about the health and safety performance of the organization	3.92	1
Participate in dialogue with regulators on health and safety matters	3.75	2
Communicate effectively the approach and commitment to safety of the organization to external organizations by means of publications and applying for awards	3.58	3
Develop a constructive and open relationship with external organizations on H&S	3.58	3
Impose inappropriate control over who may communicate with inspectors due to fear of what might be revealed to them	3.42	5

The result in Table 10 indicates that external communication is sometimes undertaken. Leadership tends to respond to any queries pertaining to poor performance on H&S and sometimes impose inappropriate control over who may communicate with inspectors due to fear of what might be revealed to them. These results are reflected with the mean value between 3.92 and 3.42, which is below 4.00 and in the band of often and sometimes.

6. CONCLUSION

It can therefore be concluded that majority i.e. 93.75% of the respondents have a tertiary qualification.

Leadership skills in H&S are vital to enhance a positive health and safety culture in SMEs' as the characteristics were agreed by the respondents.

The mean score achieved among the respondents indicate that leadership skills influence the perceived importance of H&S among staff and other team members and informing workers on how best to respond to unsafe behaviour as these attained a mean score of 4.25 and are ranked 1st. The elements identified through literature and analyzed indicate that their is commitment to H&S , support of H&S, goal setting and review of H&S, creating structure and process that promote H&S and reviewing leaders' performance/self improvement are undertaken in most of the organizations. Internal and external communication elements are used to address H&S issues. Internally leadership often communicate with managers in different sites sometimes the communication is done informally as it attained a mean score of 2.83. Leadership tends to respond to any queries pertaining to poor performance on H&S and sometimes impose inappropriate control over who may communicate with inspectors due to fear of what might be revealed to them.

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PASSIVE PEST CONTROL THROUGH THE DESIGN OF HOUSES: A CASE OF COCKROACHES

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ABSTRACT

Purpose

This paper investigates the application of passive methods of cockroach control. It looks at causes of infestation and control through design and specifications of houses.

Design/methodology/approach

Literature has been reviewed identifying causes of infestation in houses and methods of control that incorporate design. Probability and the Non probability sampling was used to identify survey participants. Questionnaires and interviews with open ended and closed ended questions were utilized to get views from households, manufacturers of building materials and design consultants on infestation and control through design.

Findings

Findings revealed that certain structural characteristics favored the breeding and nesting of cockroaches. These characteristics stemmed from the building design aspects; these include the choice of building materials, building layout, services design, space usage and specification of finishes. It was found out that the above were not adequately considered as a way of cockroach control and prevention in houses. Furthermore designers paid less attention to the incorporation of such features in their designs particularly for the purpose of cockroach control.

Research limitations/implications

Due to Financial and time constraint, the respondents were limited to those within the researcher's propinquity thus limiting opinions noted.

Practical implications

the study promotes a proactive approach in controlling cockroaches through design and specification.

Value

The study discusses the role of design and material specification in cockroach control in houses which is customarily not considered as important.

Keywords: Cockroaches, Passive pest control, Design, Specification.

1. INTRODUCTION

Tvedten (2007) defines Passive pest control as the prevention of pest infestation through proper design and specification. Pest control in buildings entails two aspects. The first aspect is the prevention through design and specification whilst the second aspect relates to the eradication of pest infestation once it has taken place.

According to World Health Organization (1989:33) certain structural characteristics in houses favour the breeding and nesting of household pests and furthermore the improvement of health and safety features in dwellings may be fostered by persuading those who design and construct housing to incorporate such features in plans, the selection of materials and building techniques. One of the most common of these household pests is the cockroach which in essence is a nuisance pest (Boraiko 1981). Making a building inaccessible and unattractive habitat for cockroaches therefore should be one of the main objectives when designing and later maintaining a building. This study discusses how prevention and control of cockroaches can be achieved using aspects of design. This is a more proactive approach that could complement the conventional reactive methods of the use of chemicals.

2. BASIS OF COCKROACH CONTROL

According to Tvedten (2007) each cockroach has its own peculiar habits and nesting. Therefore it is important to learn the habits of cockroaches, so that it is known how and where to effectively control them. The most preferred harbourages are those of the proper size that are located nearest

food and water sources and are warm and have a high relative humidity. To control these conditions is to control the cockroaches (Tvedten, 2007).

2.1 Control problems

According to Rauh (2002), cockroaches continue to reappear no matter how many times they have been professionally eliminated from a structure. The pest control industry's income revolves around the need for continual cockroach control using their ineffective volatile poisons.

According to Garfield (1990), in the United States of America more than \$1.5 billion was spent in 1989 on consumer pesticide products to get rid of cockroaches, the single largest expenditure on a pest in the country. Rauh (2002) further observes that the only real control that can be obtained safely is to reduce the sources of food, water and the harbourage points roaches need to survive. This could be achieved through designing to reduce habourage in homes.

3. COCKROACH HABITATION

About 75% of cockroaches live in the kitchen, 20% in the bathrooms and 5% elsewhere (Tvedten, 2007). Conditions that favour cockroach population explosions are those that provide abundant food, water and shelter. Cockroaches are gregarious (they congregate together) and frequently groom themselves (Department of Human Services, 2002). These should be considered in order to make a building inhabitable to cockroaches.

4. CONTROLLING COCKROACHES BY DESIGN AND SPECIFICATION

4.1 Screening openings and sealing off runways

Cockroaches travel throughout a building and from building to building on runways such as electrical conduits, heating ducts, and especially plumbing pipes. They also travel outside of the building and enter through an open window, weep hole, or ventilation duct (Slate et al. 1997: p 44). This is because service ducts are able to accommodate them and transport them from one place to another. Therefore runways should be tightly sealed with caulk at entry points into various parts of the building. Adequate design and specification of screening of openings prevents cockroaches from using them as entry points. Screens can also be placed behind grill covers and over vents or floor drains to prevent cockroach entry. Caulk should be used around the edge of the screen to make a tight seal (Slate et al. 1997: p 44).

4.2 Specification of Cockroach-Proof Fixtures and fittings in Designs

Slate et al. (1997: 44) observes that Kitchen appliances and fixtures, such as stainless-steel units, open shelving units are unattractive to cockroaches. The round shape of the metal and the general openness of the design offer few hiding places for Cockroaches. Further more free-standing storage units and appliances on wheels enable them to be rolled away from walls to facilitate thorough cleaning.

4.3 Specification of Building Fabric Materials

According to Slate et al. (1997) insect proof materials of construction such as brick, stone, concrete and steel drastically reduce the likelihood of cockroaches entering the building compared with wooden structures. Paint is also useful as an insecticide in pest control and can be specifically made non-toxic to humans and pets (Herrero et. al, 1999). A specialized paint composition effectively inhibits synthesis of chitin in arthropods and similar organisms during all stages of the biological cycle from egg to adult; additionally, the paint composition acts as a sterilizing agent for adult females. According to Herrero et al. (1999) the paint composition of the present invention comprises resin, pigments carrier and active compounds which are micro-encapsulated in a resin polymer. The composition acts on pests by inhibiting the synthesis of chitin a body building polysaccharide found in arthropod species. It should be specified by design consultants on interior walls of a building.

4.4 Design and usage of space

The creation of dead areas in buildings should be avoided, these typically occur under cupboards, voids bricked in under stairs and openings between building elements where pests can settle, for example behind claddings. Also pipes shafts, ducts and ceiling voids should be designed in order to obviate projections, recess, pockets and ridges on or within which pests can settle. Voids between brick skins provide fantastic accommodation for cockroaches thus brickwork, particularly one brick walls (two skins) should be solidly built, that is with all the spaces between the bricks filled completely with mortar. Furthermore Buildings space should also be adequately ventilated. Inaccessible areas which are permanently damp and hot should be avoided in Design as this becomes conducive for breeding.

4.5 Eliminating Cracks and Crevices

Slate et al. (1997) contends that the problem with all buildings is that they have entrances and holes through which services such as electricity, water, sewerage, gas, etc., are supplied. These provide ideal access for cockroaches which take advantage of different types of hiding places. The benefits of these hiding places are two-fold; they provide concealment which can allow quite large populations of cockroaches to develop unnoticed and render them difficult to find, and the protection afforded makes eradication by whatever method, more difficult thus:

- It is necessary to seal all cracks.
- Caulk or paint closed cracks around baseboards, wall shelves, cupboards, pipes, sinks, toilets, and similar furnishings.
- Repair small holes in window screens.
- Weather-strip around doors and windows where cockroaches may enter.
- Where gaps can't be sealed, they can be widened to make them less attractive to cockroaches. For example, the space between free-standing shelving and adjacent walls can be widened by moving the shelving one inch away from the wall. An inch-wide gap is not attractive to cockroaches (Slate et al. 1997).

4.6 Building Layout Design

Careful thought given to the layout of the building as regards its different functions at the design stage makes it possible to build it for insect control (Slate et al. 1997). The areas that attract insects are kitchens, bathrooms and toilets (source of water). Slate et al. (1997) recommends that all food processing and serving facilities should be in a separate building or confined to one area of a single building with direct access from outside.

4.7 Building Surrounds

Building surroundings can also be considered to be a contributory factor to cockroach infestation, for starters, non flowering plant species like ivy and creepers on external walls provide access routes for cockroach entry into buildings. Gravel or paving close to the building avoids the need for watering, which in turn keeps moisture away from the building and in addition it is non-attractive to cockroaches. Leaf litter, tree bark and other organic mulches can harbour cockroaches, therefore good garden hygiene and maintenance is essential. Garden rubbish must be kept well away from the building and removed or disposed off (Slate et al. 1997).

4.8 Planting and landscaping Design

There is a wide range of trees, shrubs and herbs which have insecticidal or insect repellent properties. These include; the neem tree, rosemary and cloves. These plants have insecticidal properties that have been known for some time. Which act as repellents and natural Insect Growth Regulators which disrupts insect growth.

5. METHODOLOGY

In order to effectively and thoroughly carry out and achieve the objectives of this research, both Probability and Non probability sampling methods were used. Probability sampling was used to provide a statistically efficient sample with a smaller sample size for households. For Design Consultants stratified sampling was used due to the two strata of consultants targeted. Non probability sampling was used for sampling manufacturers of paint, wooden products and cement and government ministries which had to be sampled by convenience. The survey area was confined to Lusaka and the Copperbelt Provinces of Zambia. These two provinces were chosen because of the following reasons:

- Their proximity to the researcher's place of study,
- The availability of design consultants in these provinces and
- The presence of manufacturing industries for building materials.

Data collection methods included: Both Primary and Secondary Data i.e. questionnaires, visual inspection, observation and personal interviews.

6. FINDINGS

6.1. Research participation

A total of thirteen (13) questionnaires were distributed to Design consultants, four (4) to manufacturers of wooden products, four (4) to manufacturers of paints and one (1) questionnaire was administered to a manufacturer of cement. A total of 100 questionnaires were administered to home occupants in low, medium and high cost areas of Lusaka and Kitwe, 90 have been responded to and have been analyzed separately and analysis was combined where appropriate.

Table 1: Households

Lusaka	Area	Administered	Responded
High cost-	Woodlands	10	10
Medium cost	Libala	15	15
Low cost	New Chilenje	35	25
Kitwe			
High cost	Riverside	10	10
Medium cost	Ndeke Village	15	15
Low cost	Wuzakile	15	15
Total		100	90

Table 2: Population of Registered Consultants

Design Consultants in the ¹ ZCI	Stratum size of Consultants	Sample drawn from each stratum by proportion using ² SRS(See formula above)
Architects	68	13
Quantity surveyors	15	03
Total	83	16

Table 3: manufacturers of construction materials

Manufacturers	No. of Questionnaire	Targeted Persons/department
Cement	01	Research and development
Paint	04	Research and development
Wood	05	Research and development
Total	11	

Table 4: Government Ministries

MINISTRY NAME	No. of Questionnaires	Target Body	Targeted Persons/department
Ministry of Local Government and Housing	02	Public health	Inspectorate
Ministry of Tourism, Environment and Natural Resources	02	Environmental council of Zambia	Pesticides and toxic substances
TOTAL	04		

6.2 Causes of Cockroach Infestation in Buildings

Table 5 shows the responses from households and Design Consultants from a question on what they thought caused cockroach infestation determining to what extent respondents agreed with given statements about reasons for cockroach infestation namely poor hygiene, design of buildings, building location and presence of cracks and crevices.

Table 5: Causes of Infestation

	Poor hygiene	Design of building	Location of residence	Cracks and crevices
High Cost	100%	35%	20%	45%
Medium Cost	100%	30%	15%	55%
Low Cost	100%	40%	10%	60%
Consultants	100%	10%	10%	10%

Few design consultants held that infestation was due to design (10%), due to poor hygiene(100%), location of residence(10%), cracks and crevices(10%). 100% of households in High, Medium and Low cost indicated that infestation was due to poor hygiene. Due to building design; 35%, 30% and 40% respectively. Due to location of residence; 20%, 15% and 10% respectively and due to presence of Cracks and crevices: 45%, 55% and 60% respectively. It was thus concluded that cockroach infestation was mainly due to poor hygiene; however cracks and crevices to a reasonable extent contributed to cockroach Infestation especially in low cost housing areas, this is due to the prevalence of unplastered walls. Few respondents said the design contributed with consultants admitting that there was an element of design but that it was out of their scope.

6.3 Prevalence of infestation in various parts of the building

Table 6 shows the responses from households by means of ticking from a set of options about the frequency of occurrence of cockroaches in the various parts of the house namely, Kitchen, Bathrooms, manholes for medium and high cost housing and pit latrines from low cost. Respondents indicated: high, medium or low frequency of occurrence.

Table 6: rate of infestation

	Kitchen	Pantries & store rooms	bathrooms	Manholes	Pit latrines
High cost	100%(high)	40%(high)	30%(medium)	100%(high)	-
Medium cost	100%(high)	40%(high)	30%(medium)	100%(high)	-
Low cost	100%(high)	-	10%(high)	-	86%(high)

From the above findings it was established that the rooms that were most prone to cockroach infestation in the building was the kitchen followed by manholes, pantries and toilets and bathrooms consecutively for high and medium cost. For low cost houses it was the kitchen and then the pit latrines.

6.4 Pest consideration in design

Table 7: application of passive methods by consultants

	Worked on housing projects	Pest consideration at design stage	Knowledge on passive methods
Consultants	92%	50% yes	40% yes

The findings among Design Consultants revealed that 92% had worked on housing projects before. 20% had been offering their services from between 6-10years, 30% between 1- 5years, 40% between 11-20years and 10% for 20years and over. The Consultants listed the following preventive methods of pest control that they incorporated in the design of the building.

1. The design and specification of materials used for kitchen units
2. The design of the sewer system
3. Design and specification of Fly screens for window opening
4. Design of timber floors free from moisture and treated to inhibit breeding of pests.
5. Treatment in foundations

Among the consultants 60% of them did not know about passive preventive methods of pest control that could be incorporated in the design of the building. 50% did not consider pest control among priorities in building design at design stage. Thus it was deduced that 60% of consultants know about passive preventive methods of controlling cockroaches then 60% of the time it is not considered in the design of buildings.

Table 8: Features of Houses

	Flower beds near the building	Concrete apron around building	Wooden kitchen units	Cracks and crevices	Fly screens on openings
High cost	35%	55%	65%	45%	60%
Medium cost	33%	42%	83%	50%	43%
Low cost	62%	25%	88%	76%	13%

The study revealed that 35% of high cost, 35% of Medium cost and 62% of low cost had plants near the building. 55%, 42% and 25% of high, medium and low cost housing respectively had gravel or concrete aprons around them. 65%, 83% and 88% of High, medium and low cost households respectively had wooden Kitchen units, the others units were made of steel and other materials.

Low cost housing had the most cracks(76%) probably due to lack of maintenance and building age and thus providing a suitable harbourage in which cockroaches found a place to hide. 50% of medium cost and 45% of high cost houses had cracks, these can be eliminated by Plastering and painting. Fly screens were most prevalent in high cost houses (60%) and least prevalent in low cost (13%); 43% of medium cost houses had fly screens. This could explain why low cost households indicated the most severe infestation; this is because incorporation of passive features in their design is inadequate.

6.5. Availability of cockroach proof materials

6.5.1. Paint manufacturers

Table 9: Availability of Roach Repellent Paint

	Is there a roach repellent paint?	Can additives be added to paint to make it repel pests?	Have people specified this before?	Could it be availed?
Paint manufacturers	100% yes	33% yes	100% no	33%

The findings in table 9 indicate that it is possible to add additives to paint that can repel pests. Respondents indicated that the only hindrance is the extra cost of changing the formula and the research involved in coming up with the same.

6.5.2. Wood manufacturers

Table 10: availability of roach repellent wood treatment

	Treatment for cockroaches specifically	Availability of product according to specification	Possibility of treatment against cockroaches	Request made for roach treatment by clients
Wood Manufacturers	non	100% yes	50% yes	50%

100% of wood manufacturers make construction products including household furniture and all of them treated their products for:

1. Termites
2. Dry rot
3. Wet rot

50% indicated that treating wood specifically for cockroaches they would treat the timber using lacquer thinners mixed with varnish and sealers. Since 100% the manufacturers of wooden products agreed that they did avail products according to client specification and that if clients did specify for cockroach treatment they would do so, it can be concluded that this could be a passive pest control method that would help in the reduction of cockroach infestation especially in furniture and members of the building structure.

6.5.3. Manufacturers of Cement

Table 11: availability of roach repellent materials

	Do you have a research department	Can additives be added to cement to make it repel pests	Have people specified	Could it be availed
Cement manufacturers	Yes	No knowledge	yes	It would be very expensive

Only one cement manufacturing company -Lafarge was operational in Zambia at the time the research was being carried out. Lafarge ³PLC had two types of cement available to the public:

1. Ordinary Portland cement
2. Composite Portland cement

The variance between the two was the composition, one had an additive and the other one did not. Lafarge acknowledged having received a request for cement that had an additive that acts as a pesticide but said that they did not know if it was practicably possible to manufacture such a type. Lafarge also said that one cannot order cement according to ones specifications but only that with standard specifications. Lafarge highlighted that it was expensive to produce varying cement types and that demand is not significant in Zambia and the price would be unaffordable hence the decision to have a basic product that was affordable. This implied that

adding and additive that repels cockroaches could be achieved if resources were available.

7. RESEARCH LIMITATIONS

One of the major challenges encountered in the survey was that of the scattered geographical locations of the respondents. The time and funds available were limited in some cases; several calls had to be made to secure appointments. This led to delays which were compounded by long organizational procedures that the researcher was subjected to before securing appointments with respondents. Another problem was that some respondents could not answer some questions due to lack of proper records. The other problem was with households, it must be mentioned that the time of data collection coincided with the national presidents death and subsequently National Presidential elections hence this made respondents quite hostile.

8. CONCLUSIONS

The paper investigates the application of passive methods of cockroach control and looked at the causes of cockroach infestation. It was observed that the application of passive methods of cockroach control through aspects of design and specification was inadequate in most house designs. This could be because design consultants and households alike did not think of these methods as means of pest control as Zambian households traditionally use pesticides to control cockroaches despite them being ineffective. The major causes of cockroach infestation included the ability of housing structures to support cockroaches through the availability of food, shelter and water for them. This makes any home habitable for cockroaches and nearly all households, high cost, medium cost and low cost had the problem of cockroaches due to the aforementioned.

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EFFECT OF PRACTICE ON THE PERFORMANCE OF PROJECT DELIVERIES IN LAGOS STATE NIGERIA

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ABSTRACT

Purpose of this paper

The aim of the paper is to report a study on the practices responsible for the performance of project deliveries in Lagos by surveying the methods of project delivery and its effect on performance amongst other objectives.

Design/methodology/approach

The descriptive cross-sectional survey research design was used for the study. A total of sixty respondents were selected with the use of the convenience sampling technique. The data collected were analyzed with the use of descriptive and inferential statistics.

Findings

The study indicated that the clients and end-users are satisfied with the performance levels of project deliveries and it suggests that the level of practice has an effect on the performance of the project deliveries. The practices found to be responsible for the project performance include budget monitoring, feedback and project monitoring.

Research limitations/implications

The study is limited by the fact that no direct observations of the practices used by the respondents were made. The study relied on data obtained from the questionnaire filled by respondents.

Practical implications

The findings of the study would assist in promoting the use of other building procurement systems besides the traditional system in the attainment of project goals and assist those engaged in projects to be more knowledgeable about best practices that help in achieving project success.

Keywords: Methods, Performance, Practice, Project Delivery, Quality.

1. INTRODUCTION

Over the years, the phenomenon of project success and failure has emerged as a pertinent concern to each project stakeholder. Most developing nations are faced with the problem of providing accommodation to vast majority of the populace. To facilitate the accomplishment of this objective, huge financial budgets are very often made. Unfortunately, some of such projects usually end up being uncompleted, abandoned or unsustainable (Udoeka, 2004).

Clients require the construction of various structures (such as buildings, dams, roads etc) for different reasons. What is common to all clients, however, is that they require specific structure to be completed within a specified period of time, within a specified budget and specific quality standards and all these need to be achieved with limited resources. Latham (1995) states that client's wishes on construction projects contribute to their wider objectives.

In any business, it is important that the client or customer is kept satisfied with the product and/or service that he receives from the manufacturer, seller or provider. The construction industry does not differ in terms of this requirement and therefore, in order to establish project success or failure, project performance needs to be measured in terms of these original project constraints. That is, meeting or exceeding project expectation, as determined by the consumer or client should indicate project success and vice versa.

The traditional procurement system had been in existence since the inception of the architectural and quantity surveying profession. Under this procurement system clients have relied on the architect and/or consulting engineers depending on the type of construction project, to design and supervise construction. Rowlinson (1987) states that the traditional system has been criticized for its slowness, due to the sequential nature of the work and the incidence of time and cost overruns attributed, in part, to the lack of input from the main contractor during the design phase. This method of procurement system in the construction industry has contributed to majority of the abandoned projects in Nigeria particularly Lagos State (Ojambati, 2001).

One of the legacies often left behind by successive government in Nigeria is failed projects. There is hardly any state in the country today that is not dotted with uncompleted, suspended or abandoned projects (Udoeka, 2004). As a developing country, Nigeria faces a number of socio-economic challenges. These include poverty, lack of housing, unemployment and lack of infrastructure, massive disparities between the poor and the rich, etc. which tend to impact on the Nigerian construction industry (Mbanjuwa, 1996).

A number of international companies that have recently started operating in Nigeria have introduced the use of construction management as a building procurement system. In the United Kingdom, this building procurement system already accounts for 15% of constructions turn over and has been adjudged as a preferred construction procurement method by a large number of clients (Property Reporter, 1997).

It was this quest for a high standard of performance of project deliveries that formed the focus of this study which is to research into the practices responsible for project deliveries in Lagos state, through the following objectives:-

- (i) To evaluate the performance of project deliveries through the perception of clients and end-users.
- (ii) To identify the construction professionals engaged by project management firms and how often external consultants are engaged.
- (iii) To find out how often project management organizations make use and the reasons of choice of the procurement methods in the execution of projects.
- (iv) To find out if project management practice has any effect on the performance of project deliveries.

2. PERFORMANCE OF PROJECT DELIVERIES

According to Oladapo (2006), the word project is defined as a temporary endeavour undertaken to create a unique product or service. Kerzner (1998) grouped project objectives under three headings;

- 1. Performance and quality.
- 2. Budget.
- 3. Time of completion.

Project delivery system has become a more central issue to industry for several reasons:

First, clients have been demanding better value for money since the early 1970s, driven partly by the industry's own poor productivity performance and partly by comparisons with manufacturing productivity growth. Clearly, non-traditional projects delivery systems have better time performance and cost benefits, in many cases. Ogunsanmi (2003) postulates that non-traditional systems would also offer better opportunities

for development for new production methods of material and new means of producing products, with these materials.

Secondly, the method of project delivery used by the client determines the nature of competition in the industry. If the industry is seen as players of a competitive game, the client sets the rules of that game. The evolution of project delivery strategies and policies developed by clients has changed the rules of the game over time, and clients are seeking ways to raise the standard of performance. At the end of the day, the industry competes on a playing field defined by client under rules set by clients. Thus, the Latham (1995) urged the UK public sector to play a leading role in restructuring the industry as did Gyles (1992) in Australia. In the U.S the Construction Industry Institute (CII) has promoted best practice to both clients and contractors with significant project time and cost results.

Thirdly, there is a renewed effort in investigating tendering and project delivery practices around the world. The factors behind this interest are diverse, but greater efficiency and lower costs are universal goals, and a major impetus has come from the increasingly widespread use of information technology and electronic procurement by large public and private clients. Other factors contributing to the trend include responses to changes in national and state regulations and government policies, the effects of international trade agreements, new financial structure, innovation in the industry, the importance of constructability, use of IT, the selection of the most appropriate strategies, prequalification of contractors and the role of strategic alliance and partnering.

3. PROJECT PROCUREMENT METHODS

Bennet and Grice (1992) identified the following four building procurement system categories:

3.1 The Traditional System

The traditional system had been in existence since the inception of the main contractor and the architectural and quantity surveying professions. Since then, clients have relied on the architect and/or consulting engineers (depending on the type of construction project) to design and supervise construction. A main contractor is invited to bid for the work and, if successful, starts on site as soon as possible. Main contractors, in turn, use domestic, nominated and/or selected subcontractors.

Since inception, this system has generally worked satisfactorily, however, in recent years, large projects such as power stations, airports, oil refineries and similar complex utilities have proved difficult to manage. Rowlinson (1987) states that the traditional system has been criticized for its slowness, due to the sequential nature of the work and the incidence of time and cost overruns attributed, in part, to the lack of input from the main

contractor during the design phase. Variants of this system include the use of a project manager but still utilizing a main contractor to carry out the work.

3.2 Design and Build System

In this system, the client gives responsibility for design and construction of a building to one entity. Three variants of this system exist, namely: Direct, Competitive and Develop and construct.

Design and build methods offer a single point of responsibility for clients, in other words, one organization is contracting to fulfill the design and construction responsibilities for the project. This approach has, however, been criticized on two counts: Firstly, private architects question the architectural quality of buildings produced thus. Secondly, the quantity surveying profession has cast doubts on the value for money obtained by entering into such contracts which are commonly assumed to be let by negotiation (Rowlinson, 1987). These claims are, however, countered by design and build contractors who claim to build more quickly and efficiently.

3.3 Management Systems

In this type of building procurement system the client appoints the design team for the project as well as a separate entity (consultant or contractor) to focus on the management of the construction process in return for a certain fee. Specialists or trade contractors are appointed to undertake construction work and are selected by negotiation or through competitive pricing. This building procurement system category has two variants namely, management contracting and construction management. These trade contractors enter into direct contracts with the client, who retains the time and price risks (Bennet and Grice, 1987). According to Franks (1984), Bovis has used this system in Britain for over forty years.

3.4 Design and Manage Systems

The Client appoints a single firm to design and deliver the project but specialist contractors are appointed to undertake the construction work by negotiation or in competition. The project design and manage firm may either take a contractual risk to deliver the project to an agreed price and on time (contractor) or may act as the client's agent only and other contractors enter into direct contacts with the client, who takes the time and price risks (consultant). Variants of this system include the Build Operate and Transfer (BOT) contracts, Build Operate Own (BOO), Build Operate Own and Transfer (BOOT) and Design Build Finance and Own (DBFO) are increasingly being used on large infrastructure projects (traditionally only financed by government) in Nigeria.

4. RESEARCH METHOD

The descriptive cross-sectional survey research design was used for the study; this is because the events under observation have indeed taken place already (i.e. projects have been awarded, constructed or under construction and already in use or abandoned). The study is under taken in Lagos state, Nigeria and the population of the study includes consultants or registered professionals working in project management firms as managers and technical staff, private developers, Government Institutions and private clients/ end-users. The clients include those who initiate projects, engage consultants and fund the project implementation or enter into partnership on project implementation with developers on agreed terms while the end-users are those who eventually occupy the facilities provided.

A total of sixty respondents were selected for the study with the use of convenience sampling technique. Data collected with the use of a well structured questionnaire were analyzed with the use of inferential and descriptive analytical tools.

5. DATA PRESENTATION, ANALYSIS AND DISCUSSION

The data collected and analyzed are presented under the following headings:

5.1 Types of Property Development embarked upon by the Respondents

Table 1.1 shows the types of property development embarked upon by the respondents

Table 1.1 Types of Property Development embarked upon by the Respondents							
Type of Development	1	2	3	4	5	M.I.S	Rank
Housing/Residential	-	1	-	4	31	0.96	1
Office Development	-	13	-	5	18	0.76	2
Shopping Malls	1	15	7	4	9	0.63	3
Educational	3	7	17	-	9	0.63	3
Site and Service	6	9	8	5	8	0.60	5
Recreational	8	1	14	13	-	0.58	6
Religious	8	8	6	14	-	0.54	7
Hotel	2	10	24	-	-	0.52	8

5= Always; 4= Usually; 3 = Sometimes; 2 = Rarely; 1 = Never

From Table 1.1 it can be seen that most of the respondents surveyed often embarked on the construction of housing/residential properties followed by the construction of office development, shopping malls, educational buildings, site and service, recreational, religious and hotel developments.

5.2 Performance levels in terms of end-users satisfaction in project deliveries

The opinion of the project end-users level of satisfaction was sought through the questionnaire, interview and physical observation of the project and the data collected is presented in Table 1.2.

Table 1.2 Project Level Quality Performance Assessments by End-Users

Product Attributes	Quality	80 – 100% 5	60 – 80% 4	40 – 60% 3	20 – 40% 2	0 – 20% 1	M.I.S	Rank
Conformance		2	5	3	0	0	0.78	1
Aesthetics		0	6	4	0	0	0.72	2
Perceived Quality		1	4	5	0	0	0.72	2
Features		1	3	5	1	0	0.68	4
Reliability		0	5	4	1	0	0.68	4
Serviceability		0	6	3	0	1	0.68	4
Durability		1	3	4	1	1	0.64	7
Performance		0	2	7	1	0	0.62	8

M.I.S = Mean item Score

Table 1.2 shows that the end-users perceived that the projects in the survey performed better in the area of conformance, followed by aesthetics, perceived quality, features, reliability, serviceability, durability and performance in that order.

5.3 Performance levels in terms of Client satisfaction in project deliveries

The response of the client to the project level quality assessment is presented in Table 1.3.

Table 1.3 Project Level Quality Performance Assessments by Client.

Service Attributes	Quality	80 – 100% 5	60 – 80% 4	40 – 60% 3	20 – 40% 2	0 – 20% 1	M.I.S	Rank
Consistency		1	5	4	0	0	0.74	1
Courtesy		0	6	3	1	0	0.70	2
Accuracy		0	5	5	0	0	0.70	2
Timeliness		0	4	6	0	0	0.68	4
Completeness		0	4	6	0	0	0.68	4
Accessibility		0	4	5	0	1	0.64	6

M.I.S = Mean item Score

Table 1.3 indicates that the clients' perceived that project delivery performance was considered satisfactory from the service quality attributes such as consistency, courtesy and accuracy usually exhibited by the consultants during the course of their operations.

5.4 Project performance measurement by the Project Consultants

The consultant's response to the assessment of projects undertaken by their firms is shown in Table 1.4.

Table 1.4 Performance Measurements of Projects by Consultants

Performance measures	5	4	3	2	1	M.I.S	Rank
Variation control	5	5	15	2	9	0.95	1
Timely economic completion	0	11	7	8	10	0.84	2
Price certainty	5	6	23	1	1	0.67	3
Cost economy (+10% budget)	6	0	7	0	9	0.50	4
Satisfaction by user	0	5	2	14	5	0.45	5
Design flexibility	0	0	5	26	5	0.40	6
Company policy	0	6	7	14	9	0.38	7
Number delivered	0	0	11	11	14	0.38	7
High quality	0	0	2	11	23	0.28	9

1=highly successful; 2=Very successful; 3=averagely successful; 4=partially successful; 5 =Not successful and M.I.S = Mean Item Score

From Table 1.4, it can be seen that the consultants tend to give priority to measures such as variation control, timely economic completion, price certainty and cost economy, satisfaction by users, design flexibility, company policy, number delivered and high quality projects in that order.

1.5.5 Procurement Methods adopted in the Execution of Projects

The procurement methods adopted by the project management consulting firms for executing various projects are presented in Table 1.5.

Table 1.5 Procurement methods used by the Project Management Firms

Procurement Method	5	4	3	2	1	M.I.S	Rank
Design & Build	15	10	11	0	0	0.82	1
Management Contracting	11	5	14	0	1	0.76	2
Turnkey	11	0	20	0	0	0.74	3
Traditional	0	16	15	0	0	0.70	4
Project Management	0	11	14	6	0	0.63	5
Direct Labour	0	6	20	5	0	0.61	6
Build Operate & Transfer	11	0	5	8	7	0.60	7
Labour only	1	0	14	16	0	0.51	8

5= Always; 4= usually; 3 = Sometimes; 2 = rarely; 1 = Never and M. I. S = Mean item Score

Table 1.5 reveals that the project management consulting firms often make use of Design and Build, Management Contracting, Turnkey and Traditional procurement methods in that order for their various projects.

5.6 Critical Reason for Choice of Procurement Method used by Consultants

The study sought to find out the most important reasons for the choice of procurement method used by consultants in project deliveries/executions and this is presented in Table 1.6.

Table 1.6 shows that the most important reason for the choice of procurement methods used by consultants is high quality finish, followed by price certainty, time economy and size and scope of project. These reasons are considered valid from project management point of view, because they tend to ensure project constructability and prompt delivery.

Table 1.6 Key Reason for Choice of Procurement Method used by Consultants

Reason for choice of procurement method	5	4	3	2	1	M.I.S	Rank
High quality finish	25	11	0	0	0	0.94	1
Price certainty	29	1	6	0	0	0.92	2
Time economy	2	13	0	0	1	0.90	3
Size and scope of project	18	11	6	1	0	0.85	4
Risk reduction	5	22	8	1	0	0.77	5
Design flexibility	5	14	17	0	0	0.73	6
Company policy	15	2	19	0	0	0.72	7
Project flexibility	5	12	18	0	1	0.71	8

5 = Very important; 4 = Important; 3 = somewhat important; 2 = rarely important; 1 = Not important and M. I. S = Mean item Score

5.7 Determination of Practices Responsible for the Performance of Project Deliveries

Different project management practices used by the respondents and the total practice level of each respondent are presented in Table 1.7.

Table 1.7 shows that the project management practice highly in use is budget monitoring, followed by feedback and progress monitoring whilst the least used is project commissioning.

5.8 Effect of Practice on Performance of Project Deliveries

The chi-square test result for the effect of practice on the performance of project deliveries using data obtained from Table 1.7 on The Total Practice Level and The Project Success/Failure is presented in Table 1.8.

Table 1.8 Chi-square Test Result for Effect of Practice on Performance of Project Deliveries

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Effect of practice on the performance of project
deliveries in Lagos State Nigeria

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	Value	df	Asymp.
	Significance		
Chi-square	16.889	7	0.018

Where: df = degree of freedom

Table 1.8, shows that the chi-square value of 16.889 is below the significant level (i.e. $0.018 < 0.05$) hence the test is significant. Based on these findings therefore it can be inferred that the level of practice has an effect on the performance of the project deliveries.

Table 1.7 Project Success/Failure, Management Practices and Total Practice Level

Cases	Project success/failure	Contractor selection	master programme	Planning	Mgt Setup Structure	Monitor budget	Contract document	Monitoring progress	Certify payment	Inspect works	Monitor budget & variation order	Pre-commissioning	Final account	Commission	Defect liability period	Feedback	Total practice level
1	2	.	.	.	.	P	P	.	.	.	P	.	.	.	.	P	0.45
2	2	P	P	P	P	P	P	P	P	P	P	.	P	.	P	P	0.9
3	1	P	.	.	P	P	.	P	P	P	P	P	.	.	P	P	0.63
4	1	.	.	.	.	P	.	P	P	.	.	P	.	.	P	P	0.39
5	1	.	.	.	.	P	.	P	.	.	.	.	P	.	.	.	0.18
6	.	.	.	.	.	P	.	P	.	.	.	.	P	.	.	.	0.16
7	.	.	.	.	.	P	.	P	.	.	.	.	P	.	.	.	0.16
8	1	.	.	.	.	P	.	P	P	.	.	P	.	.	P	P	0.39
9	2	.	.	.	.	P	P	.	.	.	P	.	.	.	.	P	0.45
10	2	.	.	.	.	P	P	.	.	.	P	.	.	.	.	P	0.45
11	1	.	.	.	.	P	.	P	P	.	.	P	.	.	P	P	0.39
12	1	P	.	.	P	P	.	P	P	P	P	P	.	.	P	P	0.63
13	2	.	.	.	.	P	P	.	.	.	P	.	.	.	.	P	0.45
14	2	.	.	.	.	P	P	.	.	.	P	.	.	.	.	P	0.45
15	.	.	.	.	.	P	.	P	.	.	.	.	P	.	.	.	0.16
16	1	P	.	.	P	P	.	P	P	P	P	P	.	.	P	P	0.63
17	1	.	.	.	.	P	.	P	P	.	.	P	.	.	P	P	0.39
18	.	.	.	.	.	P	.	P	.	.	.	.	P	.	.	.	0.16
19	2	P	P	P	P	P	P	P	P	P	P	.	P	.	P	P	0.92
20	1	P	.	.	P	P	.	P	P	P	P	P	.	.	P	P	0.63
21	1	.	.	.	.	P	.	P	P	.	.	P	.	.	P	P	0.39
22	1	P	.	.	P	P	.	P	P	P	P	P	.	.	P	P	0.63
23	2	.	.	.	.	P	P	.	.	.	P	.	.	.	.	P	0.45
24	1	P	.	.	P	P	P	P	P	P	P	P	.	.	P	P	0.63
25	2	.	.	.	.	P	P	.	.	.	P	.	.	.	.	P	0.39
26	.	.	.	.	.	P	.	P	.	.	.	.	P	.	.	.	0.16
27	2	P	P	P	P	P	P	P	P	P	P	.	P	.	P	P	0.92
28	1	P	.	.	P	P	.	P	P	P	P	P	.	.	P	P	0.63
29	1	P	.	.	P	P	.	P	P	P	P	P	.	.	P	P	0.63
30	2	.	.	.	.	P	P	.	.	.	P	.	.	.	.	P	0.45
31	1	.	.	.	.	P	.	P	P	.	.	P	.	.	P	P	0.39
32	2	P	P	P	P	P	P	P	P	P	P	.	P	.	P	P	0.92
33	2	.	.	.	.	P	P	.	.	.	P	.	.	.	.	P	0.45
34	2	P	P	P	P	P	P	P	P	P	P	.	P	.	P	P	0.92

35	2	P	P	.	.	.	.	P	P	P	P	P	P	P	P	P	P	0.61
36	2	.	.	.	.	P	P	.	.	.	P	.	.	.	.	P	P	0.45
Total		14	6	5	13	35	15	26	20	14	24	15	12	1	20	30		
%		39	17	14	36	97	42	72	56	39	67	42	33	3	56	83		

Where 2 = Project Success; 1 = Project Failure and P = Practice

6. DISCUSSION OF FINDINGS

Most of the respondents embarked mostly on the construction of housing/residential properties and office development. The project quality and delivery are considered to be satisfactory by the clients and end-users. The expectation of the client/end-users and the performance of the consultant are considered important to project quality delivery and satisfaction.

The study revealed that the respondents often use Design and Build; Turnkey; and Traditional procurement methods such as Management Contracting, Project Management, Direct Labour, and Build Operate and Transfer in the order of use. This can be attributed to the level and type of projects they embark upon, because complex projects attract modern methods of procurement. The preference for the use of one procurement method largely depends on the demand of the project, which is usually fixed by the client. According to Holtzhausen (1998), there is no 'best buy' among procurement systems in the construction industry.

Project success according to the respondents were determined by factors such as: clarity of project definition, client related factors, contractors related factors and efficient manner of project execution while project failure factors on the other hand were attributed to insufficient funds, inappropriateness of contract conditions, corrupt practices, and inconsistency in government policies.

The practices responsible for the performance of project delivery have been difficult to ascertain partly due to the respondents unwillingness to give information on their practice which they considered a confidential matter and the lack of record keeping of project undertaken by the firms. However, the study indicated that the practice does have an effect on the performance of the project deliveries in Lagos State. To a large extent one can conclude that some degree of project management activities are being carried out during project execution in Lagos State particularly in the area of project planning, project contract documentation, contractors selection and monitoring work in progress.

7. CONCLUSION AND RECOMMENDATIONS

It can be concluded that:

- The Client and End-users are satisfied with the performance levels of project deliveries in Lagos state.
- The global trend wherein there is a marked shift away from Traditional procurement method to Modern procurement methods such as Design and Build, Turnkey, Management Contracting and Build, Operate and Transfer are evident in the construction industry in Lagos State.

It is recommended that the importance of a project-oriented society should be encouraged and practiced by the private and public sectors. The state and indeed the Federal Government should encourage a project driven society to achieve balanced, functional and effective society. A project oriented society is that which the capital budget expenditure is higher than that of the current expenditure so as to induce high Gross Domestic Product (GDP) and Gross National Product (GNP).

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